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FIRST ANNUAL REPORT

OF THE

SECRETARY

OF THE

STATE BOARD OF HEALTH,

OF THE

STATE OF COLORADO,

FOR THE

FISCAL YEAR, ENDING SEPTEMBER 30, 1876.

BY AUTHORITY.

DENVER, COLORADO:
ROCKY MOUNTAIN NEWS STEAM PRINTING HOUSE.
1877.

STATE OF COLORADO,
Office of the Secretary of the State Board of Health,
Denver.

To JOHN L. ROUTT, *Governor of Colorado:*

SIR:—In compliance with the laws of this State, I present to you the accompanying Report for the fiscal year ending September 30th, 1876.

Very respectfully,

H. A. LEMEN,
Secretary of the State Board of Health.

3406

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REPORT.

The law establishing the "State Board of Health" was approved February 10th, 1876.

This first annual report, for the year ending September 30th, 1876, is consequently for the period of but seven months.

Very shortly after notifications of appointment were received, the Board convened in the city of Denver, and perfected plans for the future; not however without serious apprehension that the undertaking might prove abortive in so nascent and sparsely populated a community as was ours at the time. Other discouraging features were the non-existence of local boards of health (there being but one in the State) and absence of vital statistics such as can be gathered from returns of marriage, birth and death registrations. It was patent to each member of the Board that a reasonably reputable report could only be obtained through indefatigable exertion on the part of each member thereof.

The anticipations of the Board have not been realized to the fullest extent, yet it is hoped that the accompanying report may not prove without interest or profit, either to the people of the State, or the many abroad who are now looking hitherward in the hope of obtaining relief from those bodily ills, for the amelioration or cure of which our climate has become more or less famous.

The following summary outlines the accomplishments of the Board thus far:

First.—The Act establishing the Board.
Second.—Proceedings for its organization.
Third.—Names of officers and members of the Board.
Fourth.—Titles of committees and names of chairmen of same.
Fifth.—Statement of expenditures.
Sixth.—Correspondence, circulars, etc.
Seventh.—Documents received.
Eighth.—Remarks.
Ninth.—Special papers relating to topics, etc.

ACT ESTABLISHING THE BOARD.

AN ACT TO ESTABLISH A TERRITORIAL BOARD OF HEALTH.

Be it enacted by the Council and House of Representatives of Colorado Territory:

SECTION 1. That a Board is hereby established, which shall be known under the name and style of the Territorial Board of Health. It shall consist of nine members, as follows: a president, secretary and seven members, who shall be appointed by the Governor; and the members first appointed, with the exception of the secretary, shall be so designated by the Governor that the term of office of two shall expire every two years, on the last day of January. Thereafter, the Governor, with the consent of the Council, shall biennially appoint two members, to hold their office for six years, ending January thirty-first. Any vacancy in said Board may be filled, until the next regular session of the Legislature, by the Governor.

SECTION 2 The Territorial Board of Health shall have general supervision of the interests of health and life of the citizens of this Territory. They shall especially study the vital statistics of the Territory, and endeavor to make intelligent and profitable use of the collected records of death and sickness among the people. They shall carefully study the influence of the climate upon disease and health, in different localities in the Territory, for the benefit of the citizens thereof, as well as for the large number of invalids who seek relief in Colorado. They shall make sanitary investigation and inquiries respecting the cause of disease, and especially of epidemics; the causes of mortality; and the effect of localities, employments, conditions, ingesta, habits, and circumstances, on the health of the people. They shall, when required or when they deem it best, advise with the officers of the government or other State boards, in regard to the location, drainage, water supply, disposal of excreta, heating, and ventilation, of any public structure or building. They shall from time to time recommend standard works on the subject of hygiene for the use of the schools of [the] Territory.

SECTION 3. The Board shall meet semi-annually at Denver, and at such other places and times as they deem expedient. A majority shall be a quorum for the transaction of business. Should the office of president or secretary become vacant, by death or otherwise, the Board may fill said office from their number at the next regular meeting.

SECTION 4. The secretary shall hold his office so long as he shall faithfully discharge the duties thereof, but may be removed for just cause at a regular meeting of the Board, a majority of the members voting therefor. He shall keep his office at Denver, and shall perform the duties prescribed by this act or required by the Board. He shall keep a record of the transactions of the Board; shall have custody of all books, papers, ducuments and other property belonging to the Board which may be deposited in his office; shall, so far as practicable, communicate with other *State boards of health, and with* local boards of health within the Territory; he shall keep and file all reports received from such boards, and all correspondence of the office appertaining to the business of the Board. He shall, so far as possible, aid in obtaining contributions to the library and museum of the Board. He shall prepare blank forms of returns, and such instructions as may be necessary, and forward them to the clerks of the several boards of health throughout the Territory. He shall collect information, with the assistance of each member of the Board, concerning vital statistics, knowledge respecting disease, and all useful information on the subject of hygiene; and through an annual report and otherwise, as the Board may direct, shall disseminate such information among the people. It shall be his duty to act as correspondent in answering all inquiries made by non-resident physicians and invalids, who are at liberty to call upon him for special information as to the sanative influence of this climate.

SECTION 5. The Territorial Board of Health shall have the general direction and control of the system of vital statistics of the Territory, in so far as the editorial work and statistical plans of the same are concerned.

SECTION 6. It shall be the duty of all health physicians, and also of the clerks of local boards of health of each town, village and city, and the regular physician of each public institution in the Territory, at least once in each year, to report to the Territorial Board of Health, their proceedings and such other facts as may be required by said Territorial Board.

SECTION 7. In order to afford to the Board better advantages for obtaining knowledge important to be incorporated with that collected through special investigation, and from other sources, it shall be the duty of all officers of the Territory, the physicians of all mining or other incorporated companies, or the president or agent of any company chartered, organized or transacting business under the laws of this Territory, so far as is practicable, to forward to the Territorial Board of Health any information which they possess bearing upon public health, which may be requested by said Board for the purpose of enabling it better to perform its duties of collecting and distributing useful knowledge on the subject.

SECTION 8. The Auditor shall provide a suitable office room at Denver for the meetings of the Board, and for the use of the secretary, which, with all blanks, printing and binding, stationery and postage, required by the Board for the purpose of accomplishing the work for which it is hereby created, shall be paid for out of the Treasury of the Territory; *provided*, such expenses shall not exceed the total sum of five hundred dollars.

Approved February 10, 1876.

ORGANIZATION OF THE BOARD.

In accordance with the provisions of the law providing for the establishment of a Territorial Board of Health, the Governor appointed the following named persons as members and officers of the Board:

F. J. BANCROFT, President,	Denver.
A. V. SMALL,	Trinidad.
T. G. HORN,	Colorado Springs.
W. EDMONDSON,	Central.
T. M. SMITH,	Fort Collins.
R. J. COLLINS,	Georgetown.
T. N. METCALF,	Del Norte.
W. H. WILLIAMS,	Denver.
H. A. LEMEN, Secretary,	Denver.

In obedience to a call of the Governor, the first meeting of the Board was held in this city on the 12th of April, 1876, at the office of the secretary of the Board, the following members being present: Dr. F. J. Bancroft, Dr. W. H. Williams, Dr. R. J. Collins, Dr. W. Edmondson, Dr. A. V. Small, Dr. T. G. Horn, Dr. H. A. Lemen.

Dr. F. J. Bancroft was called to the chair, and appointed Drs. Small and Edmondson a Committee on Credentials.

The committee reported the following gentlemen as having received appointments on the Board, together with the dates on which said appointments expire: F. J. Bancroft, president, January 31st, 1878; T. G. Horn, January 31st, 1884; W. H. Williams, January 31st, 1884; A. V. Small, January 31st, 1878; R. J. Collins, January 31st, 1880; W. Edmondson, January 31st, 1882; T. N. Metcalf, January 31st, 1880; T. W. Smith, January 31st, 1882; H. A. Lemen, secretary, January 31st, 1884.

The officers and members of the State Board of Health, as at present constituted, are, with address of each, as indicated below:

F. J. BANCROFT, M. D., President,	Denver.
R. J. COLLINS, M. D.,	Georgetown.
W. EDMONDSON, M. D.,	Central.
T. G. HORN, M. D.,	Colorado Springs.
T. N. METCALF, M. D.,	Del Norte.
T. M. SMITH, M. D.,	Ft. Collins.
W. H. WILLIAMS, M. D., Treasurer,	Denver.
A. V. SMALL, M. D., Assistant Secretary,	Trinidad.
H. A. LEMEN, M. D., Secretary,	Denver.

COMMITTEES.

The various topics which might with propriety be discussed by a State Board of Health are almost as numerous as the causes of disease or the hygienic requirements of the human family. A few of them, however, are of pre-eminent importance.

With a view of systematizing the work of the Board, committees were appointed to report on some of the more important subjects connected with public health, as well as on one or two topics of interest to those large classes of invalids abroad who are daily seeking definite information in reference to the adaptability of our climate to their peculiar requirements. These regular standing committees are each composed of a chairman and two other members of the Board.

The subjects upon which standing committees were appointed at the first meeting of the Board, and the names of the chairmen, are as follows:

1. *Epidemics, Endemics and Contagious Diseases.*—R. J. Collins, M. D.
2. *Climate, as related to Classes of Disease.*—H. A. Lemen, M. D.
3. *The Mineral Springs of Colorado.*—T. G. Horn, M. D.
4. *Ozone, Electricity and Electrical Storms: their influence on Health.*—T. N. Metcalf, M. D.
5. *Altitude: its influence on Health.*—W. Edmondson, M. D.
6. *Illuminating Gases and Fluids.*—T. M. Smith, M. D.
7. *Influence of Climate on the Young.*—W. H. Williams, M. D.
8. *Foods, Drinks, and Water Supply.*—A. V. Small, M. D.
9. *Sewers and Sewage.*—F. J. Bancroft, M. D.

Professor Aaron Gove, Superindent of Public Schools of Denver, was invited by a unanimous resolution of the Board to report on the following subject: "Education; the relation of schools to health, the kinds and methods of instruction, and the capability for mental exertion in this Territory.

EXPENDITURES.

The limited amount of funds placed at the disposal of the Board, necessitates a most careful expenditure of the same. The sum is so small in fact, that a mere beginning can be made the present year, and the Board finds it impossible to publish half as many copies of the "Report" as there is good reason to believe the home public will demand.

Purchases have been made for the use of the Board, as follows:

1 Box Envelopes,	$1 25
100 Government Stamped Envelopes,	3 35
1000 Letter Head Paper,	5 40
1 Record Book,	4 00
Printing Letter Heads and Envelopes,	4 75
1 Letter Book,	1 75
Oil and Blotting Paper for same,	40
2 Quires Foolscap,	1 00
Sundries, as per vouchers on hand,	2 35
2 Quires Letter Paper,	80
15 Copies Rocky Mountain News, stamped wrappers,	1 00
Expressage on documents addressed State B'd Health,	1 25
Expressage on Met. blanks forwarded to Col. Springs,	35
500 Letter Heads,	4 25
500 Modified Letter Heads,	2 50
400 Meteorological Blanks,	10 00
Total,	$44 40

CORRESPONDENCE, CIRCULARS, Etc.

Shortly after the organization of the Board, letters were addressed to the Secretaries of the various State Boards of Health in existence at the time, as also to the Secretaries of the Boards of Health of the different prominent American cities, informing such Boards, through their Secretaries, of the organization of this Board, and requesting copies of their published reports.

Their being but one local Board of Health in the State, (Denver), and no system of registration of deaths and births, outside of the latter place, nor any legal provision whatsoever, securing annual returns of vital statistics to this Board, it was not necessary to issue "circulars," as would be required under legal enactments, providing for such measures. The only blank forms issued were those furnished the Signal Service Sergeants, at Pike's Peak, Colorado Springs, and Denver.

DOCUMENTS RECEIVED.

The Board gratefully acknowledges the receipt of the following reports, circulars, etc:—

First and Second "Annual Report State Board of Health, of Michigan."

Fourth and Fifth "Registration Report, (births, deaths, marriages,) State of Michigan;" "Laws of Michigan, concerning the Solemnization of Marriages, and the record and return of Births, Marriages and Deaths;" "Laws of Michigan, Relating to the Public Health;" State Board of Health, of Michigan, Circular: "The Entailments of Alcohol;" also, numerous other circulars and blank forms, as well as one-half dozen "Ozone Scales." First, Second, Third, and Fourth "Annual Report Board of Health, of the District of Columbia;" Eighth and Ninth "Annual Report of the Board of Health of the City of St. Louis;" "Transactions of the Medical Society of the State of Pennsylvania."

REMARKS.

It will be seen by reference to the list that quite an extensive range of topics was selected. It is a matter of regret that a greater number has not been reported upon.

It is not to be expected that the subjects selected can be satisfactorily treated, to say nothing of handling them exhaustively, in the short time intervening between the organization of the Board and the issuance of this report.

They are vital problems of daily human existence, and will inevitably engage the attention of the Board for years to come.

That the Board may successfully carry out the designs for which it was created, however, not only implies intense and continued exertion on the part of the members thereof, but absolutely necessitates certain assistance from the State. As yet a mere commencement has been made. To secure further usefulness of the organization it is believed the adoption of the following recommendations by the State is absolutely necessary:

1. The establishment by *legal enactment* of local Boards of Health in the various towns and counties of the State, which Boards shall be compelled to report annually, or semi-annually, to the State Board.

2. The enactment of a law providing for thorough registration of all marriages, births and deaths, occurring within the limits of the State, and an annual return of the same to the State Board.

Without such enactments as the above, it will be impossible for a central Board to "gather" the facts pertaining to the prevailing diseases within the State, their mortality, causes, increase or decadence of the population, and a thousand and one other data which go to make up a commendable report of State Board of Health.

3. Reasonable provision should be made for printing and disseminating among the people within, and to many of the conservers of health without the State, the information gathered together by the Board.

But appropriation is not only necessary for the publication and dissemination of the work of the Board, but also that the experience and learning of experts in hygienic science may be occasionally obtained by the Board, as for example: The analysis of water used for drinking or cooking; the analysis or inspection of suspected foods; the investigation of the properties of illuminating gases or fluids.

In regard to the matter of publication it is quite essential, frequently, in order that the subject matter of the report be understood by the reader, that plates or engravings be employed, as for example, in presenting the methods of resuscitating persons drowned, or partially asphyxiated by the inhalation of gases noxious to life. Topography and drainage, sewerage, geologic formation, all influencing health to a wonderful extent, can be taught most effectually by illustration, or at least such subjects are the better understood by the employment of cuts to illustrate the meaning of the writer.

Every State Board of Health should be provided with a few simple contrivances for taking the specific gravity of fluids, and above all, for testing the purity of illuminating fluids.

When the populace can be persuaded that it is economy to learn and practice the laws of health, appropriations of money to assist them in the attainment of such ends are readily obtained; they become not only *willing* but *anxious* to sustain Boards of Health having almost unlimited powers.

Many of the older communities of the world so fully realize the fact "that every death implies a total average of 730 days of sickness," and a consequent curtailment of the wealth of the community in which it occurs proportionate to the productive value of the services of the deceased, that they readily appropriate from the public treasury the comparative pittance required to carry on the work of efficient Boards of Health.

How much more necessary for our own State, whose "stock in trade," to the extent of millions of dollars, is her reputation for salubriousness?

How important that definite information in reference to the healthfulness of our favored region be heralded to the famishing health seekers of the more populous portions of the new world, as well as the continent of Europe?

The extent to which this information will be furnished, as well as the rate, will depend largely on the amount the State invests in enterprises calculated to secure and disseminate reliable information, not only among its own inhabitants, but throughout the length and breadth of the land, on such and kindred topics as have already been selected for study.

The appropriation of five hundred dollars by the last Territorial Legislature, to carry on the work of the Board, will be exhausted in the publication and dissemination of this report.

If the Board, therefore, publish and disseminate a report next fiscal year, as the law requires, an appropriation for that purpose is indispensible. Without it all efforts will necessarily be paralyzed.

It remains, therefore, for the "first Legislature under the new Constitution," to determine whether the work already engaged in shall suddenly come to a termination for want of the funds to prosecute it still further.

It may be proper to state in this connection that the members of the Board perform their work *gratuitously*.

SPECIAL PAPERS RELATING TO PUBLIC HEALTH.

At a regular meeting of the Board on April 12th, 1876, a resolution was adopted to the purport that no paper shall be published in the Annual Report of this Board, except such as shall have been approved for the purpose of publication by a majority of the members of the Board, and that all papers published shall be over the signature of the writer, who alone shall be responsible for the statements of facts or opinions expressed therein.

In accordance with the tenor of this resolution, eight special papers have been prepared and ordered published in this report, as follows: A paper on "Sewers and Sewage;" one on "The Usual Modes of Constructing Sewers, and the Practicability of their Operation in this State;" one on "Altitude—Its Influence on Health;" one on "The Mineral Springs of Colorado;" one on "The Climate of Colorado in Relation to Asthma;" one on "Schools, their Relation to Health, etc.;" one on "Foods, Drinks, and Water Supply;" and one on "Pulmonary Consumption in its Relation to the Climate of Colorado."

These papers have all been prepared expressly for publication in this report. The paper on "Schools, etc.," as well as the paper on "The Usual Modes of Constructing Sewers, etc.," appeared in one of the daily papers of Denver, while the introductory and concluding remarks of the paper on "Pulmonary Consumption" were read before the State Medical Society, which convened in Denver last June, and were printed in the "Transactions" of that Society for the year 1876.

Extended remarks on these papers in this connection are not required. They all relate to topics of momentous importance considered in relation to the conservation of public health.

Some of the papers, considered as a whole, are merely introductory and general in their character, the writers expressing a desire or expectation, to follow the subject up in the future, when better opportunity for particularizing shall have been presented, such being the case in regard to the paper on " Foods, Drinks, and Water Supply," so also with the paper on " Altitude—Its Influence on Health."

Dr. W. H. Williams reported " progress," and asked to be continued on the subject assigned him, as, owing to absence from the State much of the time during the summer, and illness during the fall, his report was not completed in time for publication.

In reference to the paper on " Pulmonary Consumption," the only excuse for publishing the list of cases, on which is based the pith of the report, is, that physicians and others who may be interested, may see, from a careful record of the results of physical examinations and relation of symptoms, the *character* of cases coming here for relief. In publishing the list the writer yielded to the expressed wish of his co-laborers.

Electricity, electrical storms, and other meteorological phenomena characterized by excess or defect, are so characteristic of the climate of this State, that it was the hope of the Board that the Chairman of the Committee on the topic, " Electricity, Electrical Storms, their Influence on Health," would find it convenient to prepare a paper on the above topic for publication in this " Report;" but as such has not been the case, it at least becomes me to not pass unnoticed the valuable contributions in this department made to the Board by James A. Barwick, Sergt. U. S. Signal Service, Denver, and Chas. M. Hobbs, Sergt. U. S. Signal Service, at the Colorado Springs and Pike's Peak stations, who have respectively furnished this Board with monthly reports, in triplicate, of the residual quantity of " ozone " in the atmosphere at their respective stations. These reports on " ozone " embody associate thermometric, barometric, and hygrometric observations, while the *direction* and *velocity* of the wind, the amount of rain or melted snow, and the " state of the weather," with reference to " clear," " fair," or " cloudy," are given.

The reports are very complete and constitute the *first* " official " and strictly trustworthy records of the kind which have yet been taken in the localities alluded to. When these " Meteorological Reports" shall have extended through the space of a year, it is thought that sufficient information will have been obtained to justify an effort to generalize therefrom. Until then, however, such effort would necessarily be crude, as not covering the four seasons of the year, as well as from paucity of fact, and consequently, inopportune. The Board, therefore, *waives*, for the present, engaging in an undertaking which, to the truly scientific mind, would reveal a prurient, puerile tendency to jump at conclusions, or revel in generalizations hatched from scanty material.

THE ANNUAL ADDRESS

TO THE

State Board of Health of Colorado.

By F. J. Bancroft, M. D.,

Of Denver, President of the Board.

PRESIDENT'S ADDRESS.

It is with very great pleasure, gentlemen, that I welcome you here to-day—pleasure arising from the mere fact of meeting again my fellow-laborers in the great work delegated to us, and pleasure in the anticipation of gaining from you, each and all, that which you have brought as the foundation stones of our work. For, although only six months have elapsed since we were called together as a Board, a time hardly long enough to give us even a fair insight into the vast field to which our attention has by authority been directed, yet the consideration that each has given to this great public interest, will not only add to our individual information, but be of benefit, I can not but hope, to the many for whom we labor. It is no light task that has been delegated to us, no common burden that has been laid upon our shoulders, for to no portion of the civilized world, so far as my knowledge extends, are turned to-day so many hearts filled with anxious inquiry and desperate hope, as towards Colorado. To faithfully tell to questioners outside of our boundaries, what benefits our far famed climate can dispense to those seeking restoration to health and strength, and, at the same time to keep such watch and ward as is allowed us, over the sanitary condition of our land, never failing in persistent effort for its hygienic well-being, is a solemn and difficult duty; in discharge of which we cannot be too earnest. We labor not simply for the present, but even more for the great future, because it is much with the sanitary status of a community as with all other conditions, as *commenced*, so *continued*. Laxity may deteriorate, or reform may improve, but the *beginning* never loses its effect. There are probably none of us who will live to see many of the aims of our board fully accomplished, but the work well begun will be a blessing to our country, a comfort and honor to ourselves. In the words of an English member of our profession: "We are privileged more than any who have as yet lived on this planet, in being able to foresee, and in some measure estimate, the results of our wealth of labor as it may be possibly extended over and through the unborn. * * Thus we are led to feel this great object—that to whatever extent we, by our exertions, confer benefits on those who live, we extend the advantage to those who have to live; that one breath of health wafted by our breath may, in the aggregate of life saved by it, represent in its ultimate effect all the life that now is, or has been." It may not be amiss for us, now, at the opening of our session, to glance at the matters primarily requiring our attention, some of them already elaborated by you individually for our *general consideration*, and others to be taken up as time may allow. If, in my enumeration, I omit any topics deemed of public interest or value by any of you, gentlemen, I beg you to add them to my list.

TOPICS OF IMMEDIATE INTEREST.

As some of these matters are more of local than general interest, I accord them first mention:

1. Sanitary regulations, including the subject of ventilation and removal of filth, water supply, and quarantine rules for our towns and cities, are certainly worthy of our serious notice.

2. The intemperate use of alcoholic drinks and opium continues to wreck the lives of many born to greatness and good deeds, and to bring desolation to as many homes as ever. Notwithstanding the fact that the wisest heads have endeavored to check this growing evil without great rewards, our board may possibly do much to stay its progress.

3. The social evil is still as insidiously corroding the public health as ever. For the sake of the present generation, and for the thousands unborn, something, besides moral suasion and the present effectiveness of prayer, ought to be attempted to stop the moral and physical evils induced by it.

4. Over-taxation of strength is a very common evil, and one concerning which men seem strangely, often wilfully, ignorant. The terms "active business man," "close student," "indefatigable housewife," are often synonyms for impaired constitution. Life is elastic, and will bear a great tension for a short period of time without harm, but a steady overstrain either snaps the thread asunder, or deprives it of all spring and strength.

5. It is eminently our prerogative to show our interest in the education of the young, and, besides a strong advocacy of commodious, cheerful, well ventilated and heated school buildings, and a safe average of studies for the growing child, to recommend forcibly the teaching, first and last, of physiology and the rules of hygiene. If half of the deaths in the human family are caused by the preventable diseases, and death represents but imperfectly the suffering made by them, it should be early and clearly impressed on the minds of the young that filth, and excesses in labor and enjoyment, are the instruments of misery, disease, and early death, and that cleanliness in its broad sense, and moderation, are conducive to happiness, prosperity and long life.

6. The illuminating gases and oils are necessary evils, and their use often fraught with danger to life and property. The kinds possessing the least explosive qualities, and the safest method of using them, are items of information of great practical interest and worth to the people.

7. Love of the beautiful is so much stronger than care of health in the breast of the average American, that many there are who still adorn their dwellings with wall-paper possessing the delicate hues only obtainable from arsenic. Whether or not our warning be heeded, it is yet plainly our duty to give it, "in season and out of season."

MATTERS OF CLIMATE.

Among the topics that are of especial interest and importance to the strangers within and without our gates, are the following:—

1. The effects of altitude upon health and different phases of disease.

2. The effect of altitude upon children in connection with education.

3. The adaptability of different portions of our State to the relief or cure of different diseases, and especially different phases of pulmonary affections.

4. The curative powers of highly electrical atmosphere. As altitude increases, the air is more highly charged with electricity and becomes positive, though subject to great variations in intensity, often culminating upon our high mountains in electrical storms, in which every rock appears to be on fire, and the air seems full of sparks, accompanied by a snapping, buzzing sound, as if a bunch of fire-crackers had been thrown upon a bee's nest. These phenomena are not seen upon the plains, but even here the air is often so highly charged, that it produces in physiques of an extremely nervous, sensative organism, a tensity painful to bear, and unfavorable to quiet sleep. What effect such atmospheric condition may have upon certain diseases, it is our function to learn and declare.

5. In many places on the plains and among the mountains, minerals springs, both hot and cold, are bubbling up. The great quantity and variety of metallic deposits in the land, must give intermixtures of ingredients in the water, possessing different physiological and theraputic effects, new and interesting. The analyses, properties and powers of these springs are often asked for, and may be the source of much benefit and relief to invalids through the world.

6. In regard to the suggested topic concerning "the effect of altitude upon children," in connection with education, I desire to make one suggestion. This country has not been settled long enough to yet allow us to verify with facts the exact extent of mental and physical growth of those born here, or brought here in early childhood, excepting as regards the Indian. Intellectually, the Ute, mountain Indian, is equal to the average of his race; the Sioux, prairie Indian, is bold, ferocious and cunning, occasionally more than a match for the white man in war, and in making treaties. Physically, the Ute is short and possesses a deep and broad chest, giving great capacity to the vital organs. The Sioux is tall and athletic. No better specimens (physically) can be found of the "genus homo" than among the Sioux. The practical bearing of this on our subject is to ascertain in what localities and at what altitude the growing child may gain the best physical and mental development. If high altitude increases the breathing capacity and strength of the heart, and the plains produce tall, athletic men, it is not improbable that places may be found in Colorado, where growing children may attain best possible health and longevity, where the majority of males who attain adult years may have a weight of 180 pounds, and a chest girth of forty inches, with height of six feet, which measurements approach as near to physical perfection as is often attained. This, added to the exhilarating effect of the atmosphere, which induces activity, and the brilliant and ever-changing sky scenery, the magnificent

views of, and amidst our grand mountains and plains, which are to most natures ennobling, refining and Christianizing, would render such places of great national importance as sources of physical and intellectual strength. For, in view of the great number of children growing up in the large cities, too delicate to improve their privileges, or take any worthy part in the battle of life, it seems to me that no one boon would be a greater national blessing than a place where superior educational advantages can be found combined with certainty of thorough physical development. I hope that this matter may commend itself to your approval and interest, gentlemen, as fully as it does to mine, and that thus from the various localities represented by you, we may gain the information necessary for a certain and particularized establishment of this fact.

HONEST INFORMATION.

There is no one necessity that impresses itself so strongly on my mind and heart as that of perfect honesty in all the information which through us will be sown broadcast over the world. Let not love for our favored land, nor enthusiasm over our beautiful Rocky Mountain home, with its wealth of hygienic, mineral, agricultural, scenic and social blessings, make us in any degree exaggerate its sanitary powers, or fall short in telling the whole truth in regard to stages and phases of disease that may or may not be benefited here. Let it never be by our means that this glorious sunshine is shadowed by the despairing grief of those who have brought their loved ones here too late; never by our means that this clear air is ruffled by the moans of the dying, and the wailing of survivors who have left home comforts and luxuries, lured here by false advice and false hope. Let the motto of our Board be "Honest and unremitting endeavor for the benefit of our fellows," and by God's help our labors will be crowned with the laurel wreaths of a people's blessing.

REPORT

ON

Altitude: Its Influence on Health.

By W. Edmondson, M. D.,

Member of the Board.

ALTITUDE: ITS INFLUENCE ON HEALTH.

By much the larger portion of the human race have in all ages inhabited those regions of the earth which are comparatively but little elevated above the level of the sea. While at the present time man is more generally diffused over the surface of the earth than any of the lower animals, it is probable that at the beginning of his career he gradually spread from the more favored to the less favored portions of inhabitable land, either as the pre-existing settlements became too populous, and forced a part of the inhabitants to seek another abiding place, or as the advance of civilization enabled mankind to overcome obstacles to the colonizing of distant countries which, in a primitive barbarism, would have been impossible. With every change of his dwelling place, he was forced to undergo a change in his physical organization, to meet the exigencies of a new climate, a different altitude, a changed diet, and an unfamiliar manner of life. This physical change is called acclimatization, and it is my present object to make a few observations upon the acclimatization of the European race to the mountain regions of Colorado.

To a person in the enjoyment of a fair degree of health, the sensations attending a first entrance into the regions under consideration are almost always pleasant. The dryness of the atmosphere, together with the electricity therein contained, combined with perhaps other peculiarities of climate, excite the nervous system to a remarkable degree of tension. The physical functions, which it may be for years past have been accomplished in a sluggish, inefficient manner, at once assume a vigor of action to which the system has heretofore been a stranger. The appetite is keen, the digestion is vigorous, and the sleep is sound.

The result of these manifold innovations on the established routine of the vital economy is, that all those lurking ailments to which the civilized man is more subject than he ought to be, are swept at once away, and whatever there is in each individual of capacity to enjoy is called into the fullest action. He revels in what might be called an intoxication of good health. An unclouded mind partakes of the elasticity of a healthy body, and the unwonted vigor of his intellect is manifested by a newly aroused desire for activity and by an increased capability to accomplish.

This is the beginning that is experienced in a greater or less degree by all who visit these elevated regions, and the pleasure attendant upon such a beginning will forever render the Rocky Mountains a resort of unequaled attractions for the tourist. The tourist, though not usually an invalid, in the *strict sense of* the word, is yet very generally desirous of improving his bodily and mental condition. He requires a respite from the ordinary cares of business, and he is always desirous of novelty and recreation. These he is sure to find in Colorado.

But besides the crowd of mere pleasure-seeking travelers who come westward every year, there are thousands of invalids, suffering from a wide range of chronic diseases, who come on a pilgrimage in search of health. In many instances the relief obtained is surprisingly rapid. The asthmatic martyr forgets, in the quiet of undisturbed slumber, his nightly suffocation. The victim of chronic bronchitis discovers a new lease of life, and after the lapse of a very brief period, he finds it hard to realize that he had been so recently afflicted with a cough so distressing, so violent, and so dangerous. The sufferer from malaria in that most obnoxious form called fever and ague, is glad to have fled away to a land where fever and ague never comes.

My experience with asthma has been quite different in different cases, with respect to the relative effect of the mountains and the plains in relieving or curing this disorder. I have met with several patients who received only a moderate degree of benefit in Central City and places of like altitude, but who perfectly recovered in Denver or in Southern Colorado. I have again met with other cases, but these are in the minority, which are relieved to any considerable degree only in the more elevated mountain districts, and which are always aggravated by a descent even as far as the foot-hills along the base of the mountains. But I have yet to hear of a single instance of a sufferer from asthma who has visited every inhabitable portion of Colorado in vain.

In the early stages of pulmonary consumption, the effects of our climate have been generally gratifying—different degrees of altitude being especially adapted to different cases. On theoretical grounds, those inclined to hemorrhage ought to avoid the higher elevations, but this course is not in all cases supported by the facts, for I have seen invalids who have suffered from hemorrhage of long standing who were entirely cured by a continuous residence in the high mountain region of Gilpin County.

In the treatment of consumption it has always been a source of regret that the patient himself is the last person to become alarmed at his own condition, and the last to awaken to a realizing sense of his own danger. In spite of the advice of physicians and friends, he refuses to give up his business cares and to exile himself for months and perhaps for years for the sake of relief from what he deems a trifling malady. It is from this cause that among those suffering from disease of the lungs so many come to Colorado who ought to remain away, and so many remain away who ought to come. We witness every year the deplorable effects of coming after the disease has reached its final stages. Yet perhaps every one who has hastened his death by coming too late, might at least have materially prolonged his life if he had been warned in time.

The question has often been raised as to whether pulmonary consumption ever originates in the Rocky Mountains. Observation has confirmed the fact, that though very rare, it does sometimes occur; judging from my own experience, it would seem that negroes are more subject to the disease than whites. During a residence of eight years in Central City there have come under my observation ten cases which I regarded as of indigenous origin. Of those attacked six were negroes and three were whites. The remaining one was an Indian of the tribe of the Utes, and a native of the mountains. They all died of acute phthisis within six months after the first symptoms manifested themselves. All those of the negro race died within the first three months.

In not one of these cases could I trace the disease to an hereditary origin. The victims had all lived several years in the mountains in the seeming enjoyment of good health. I do not remember of ever having heard of an instance of a newly arrived immigrant having been attacked with the disease.

There are a number of maladies, chiefly of a chronic type, upon which the effects of a high altitude cannot be said yet to be fully determined. Among those maladies which are sometimes cured and sometimes rendered worse, I mention as examples, chronic rheumatism, chronic catarrh, and the so-called hay fever. There are a few unfortunate sufferers from the latter disorder, to whom our climate is to the last degree aggravating.

Other diseases there are, to which the mountains of Colorado seem to be totally unsuited. Conspicuous among these are epilepsy, chorea, and organic disease of the heart. These are all unpleasantly frequent as endemic disorders, and generally the only means of relief that can be hoped for by those afflicted with either of them, is to leave the mountains forever. Nothing can exceed the folly of allowing the victims of the more serious forms of heart disease to visit the Rocky Mountains. Yet the mistake has often been committed, and sudden death has been the not unfrequent penalty.

But neither the experience of the tourist, who comes to-day and is gone to-morrow, nor that of the invalid, whose sojourn is limited to a few months, or to a few years at most, can decide the question of acclimatization. The permanent settler alone can put to its final test the effects of climate on a foreign race. The time has not yet elapsed for this test to have approached anything like completeness, and it is quite probable that the present generation will pass away, leaving the question only partially solved.

That pleasant condition of elasticity of mind and body, which has already been described, is unhappily not a permanent one. It may be likened to those musical instruments whose strings have been newly stretched to their utmost tension, which enables them to give forth their tones of harmonious sound, while if the tension be suffered to remain permanent, the power of vibration is lost. Periodical relaxation is the law of nature, and if this law be violated, the end is debility. To this form of debility I am convinced that every permanent resident of the Rocky Mountains is liable, simply because the tendency of the climate is to stimulate both mind and body to a greater extent than is compatible with his present organization. It is a significant fact that acute diseases almost without exception, attack with violence; and that they prostrate more speedily, and either end in death more quickly, or in convalescence more slowly, than they do in less elevated portions of the continent. It is unusual to meet with anyone of either sex who has been a resident of the mountains for a few years who does not complain of the wearing effect of the climate, but I shall reserve for a future report a body of testimony to show that the European race has not yet become acclimated to the Rocky Mountains.

SEWERS AND SEWAGE.

A PAPER ON THE

INDUCTION OF DISEASE

BY

DRY AND LIQUID REFUSE

AND

THEIR REMOVAL AND UTILIZATION,

BY

F. J. BANCROFT, M. D.

Member of the Board.

INCLUDING A LETTER ON THE

USUAL MODES OF CONSTRUCTING SEWERS, AND THE PRACTICABILITY OF THEIR OPERATION IN THIS STATE,

BY

HARVEY C. LOWRIE,

City Engineer of Denver.

SEWERS AND SEWAGE.

This beautiful land of mountains, plains and parks, ever bright and sunshiny, blessed with good water, constantly flowing to us fresh and cool from the perpetually snow-clad mountain-tops, and with an atmosphere pure, dry and exhilarating, although given to civilization free from all contaminations less than two decades since, is now, in many places, sadly changed.

The crowded and fixed habitations which have sprung up on the plains, and amongst the mountains, are in imminent danger of losing, not only their healthfulness, but also their world-wide reputation therefor, by atmospheric and water pollution.

If the experience of far older countries is now heeded, if, from all the combined wisdom of centuries on this subject, and from all the carefully-formed plans which have been framed for the preservation of cleanliness in towns and cities from the very distant past to the present, we can now arrange a safe method for the removal of present, and the prevention of future, sources of pollution, we may be able, aided by the peculiar dryness of our atmosphere, to restore to *it* its original purity, and to our State its rightful reputation for cleanliness and healthfulness.

For the better consideration of our subject, it may be classified under four heads: 1st. What are the causes of atmospheric and water pollution? 2nd. What diseases are induced by them? 3rd. How shall filth be prevented or removed? And 4th. What shall be the final disposal of it?

1st. Under the first of these heads may be classed human and animal fecal matter, dead carcasses of animals, fowls and insects; dry refuse, such as bones, vegetables and sweepings; expectorations and other substances that render the floors of habitations dirty; cutaneous transpiration if not frequently removed from the person; in fact nearly all substances capable of septic ferment.

The atmosphere and water everywhere contain germs of organic life of an infinite variety, some of which are incapable of harm, while others are deadly poison to human life if introduced into the system in sufficient quantities to overcome the natural resistance to disease that every living being possesses. In their unpolluted conditions atmosphere and water do not as a rule contain germs in amounts sufficient to induce disease, but abundant for the rapid multiplication of its species whenever and wherever a suitable place or material is found.

Dr. Lionel S. Beale, (of London,) says :—

"Any living particle growing or capable of growth, may be termed a 'germ.' Every germ comes from living or germinal matter, and from this only. A particle of living matter, less than the 1-100,000th of an inch in diameter is a living germ. It may take up lifeless matter and convert this into living matter like itself, and thus grow * * * * So that a germ is but a particle of living matter, which has been detached from already existing living matter, and this living matter came from matter of some sort which lived before it." * * * *

"They may remain so quiescent for months that no one would believe the germs were in existence, but in a night, the air or water of a district may become peopled with countless multitudes of beings, not one of which was to be found a few hours previously."

Prof. Tyndall's experiments in relation to the production of fermentation through the agency of germs floating in the atmosphere, published in "Chemist & Druggist," and recopied into the "Half-Yearly Compendium of Medical Science," July 1876, led him to the following conclusions:

"That, so far as he can judge from the evidence furnished by a long series of experiments, performed with the utmost ingenuity and carefulness, there is an impassable gulf between matter and life, which separates eternally these divisions of creation; that, in the lowest form to which we can trace living organisms, there is still abundant evidence that propogation is dependent on previous living beings, and that these do not spring from an exterior, or a dead source."

"The method pursued by Prof. Tyndall, was to construct a number of small chambers, with glass sides and front, and wooden frame works; along the bottom were apertures for a row of test tubes, and above, an arrangement for the admission, into the test tubes, of the liquids to be experimented on. These chambers were allowed to stand a few days, until a concentrated beam of light, passing through them, showed by perfect darkness that the motes in the air had all settled on the sides and bottom, where they were retained by a coating of glycerine."

"The test tubes were then filled, boiled from below, and abandoned to the action of the moteless air."

"The question to be resolved was: Can air, thus retaining all its gaseous mixtures, but self-cleansed from mechanically suspended matter, produce putrefaction? To this question both animal and vegetable worlds returned a decided negative."

"Among vegetables, experiments were made with hay, turnips, tea, coffee, hops, repeated in various ways with both acid and alkaline infusions. Among animal substances, there were many experiments with urine; while beef, mutton, hare, rabbit, kidney, liver, fowl, pheasant, grouse, haddock, sole, salmon, cod, turbot, mullet, herring, whiting, eel, oyster, were all subject to experiments."

"The result was that infusions of these substances, exposed to the common air of the Royal Institution laboratory, maintained at a temperature of from 60° to 70° Fahr., all fell into putrefaction in the course of from two to four days. No matter where the infusions were placed, they were infallibly smitten in the end. The number of tubes containing the infusions was multiplied till it reached six hundred, but not one of them escaped *infection.*"

"In no single instance, on the other hand, did the air which had been proved moteless by the searching beam, show itself to possess the least power of producing bacterial life, or the associated phenomena of putrefaction."

"The power of developing such life in atmospheric air, and the power of scattering light, are thus proved to be indissolubly united."

"The sole condition necessary to cause these long dormant infusions to swarm with active life, is the access of the floating matter of the air. After they have remained for four months as pellucid as distilled water, the opening of the back door of the protecting case, and the consequent admission of the mote-laden air, sufficed in three days to render the infusions putrid and full of life."

The process of bread-making by yeast, so familiar to every house-wife, offers a good illustration of the rapid increase of minute organic life: "A fungoid vegetable organism. composed of minute globules which attain a maximum diameter of 1-4,000th of an inch," is rapidly propogated until life is arrested by heat, or until all material in the bread necessary for this growth is consumed. The yeast plant thus generated is not ordinarily harmful to the higher animal life, but the organisms formed by the putrefaction, or septic ferment of excremental matter, animal and vegetable refuse, are capable in themselves, when introduced into the human body in sufficient quantities, of inducing a great variety of diseases. Whether the organisms thus produced are morbid Bioplasts, or Bacteria is not a matter for discussion in this paper.

They can "gain access to the body in the food we eat, in the water we drink, and in the air we breathe;" they often enter through abraded surfaces, and, it is believed, through the pores of the skin. They are more insiduous in their attacks upon human life than even the most careful among us, can at all times, realizingly remember. Illy ventilated sleeping apartments, unaired beds, all the gases generated within dwellings, favor their growth. Damp and unclean cellars furnish miasmas which permeate every part of the dwelling above; gases which escape from drains and sewer pipes are exceedingly dangerous; air too often breathed for lack of ventilation becomes carbonized, and has the effect of checking the constant repair of the body, and of lessening the elimination of its waste products.

Putrefaction not only furnishes a condition of air suitable for volitization and diffusion of germs generated by the ferment of filth, but is capable of giving life and virulence to germs of disease which seem to have a birthplace only in the human body: among which may be mentioned the contagion of small-pox, of cholera, and the plague, etc. After morbid particles are diffused into foul air, they may be wafted by the wind to salubrious places, thus exposing those most carefully observant of hygienic rules to the dangers created by negligence and slovenliness.

Water affected by gases of decomposition, and bearing particles of dead matter, serves as one of the most common means of distributing living germs, even if it does not conduce to their multiplication. Water so polluted by slop-holes, broken or imperfect sewers, gutters, privies, cess-pools or stagnant ponds, often finds its way by seepage into wells, cisterns, springs, and even streams of running water. It is against water pollutions that the citizens of Colorado, must take special pains to guard, for the dryness of the atmosphere is unfavorable to the maintenance of living germs, though there are times and places when and where disease may be carried and multiplied in this manner to an alarming extent.

The pollutions of drinking water are more common than the public is inclined to believe, and it is much oftener a channel of disease than is commonly known.

The impurities of well water are not infrequently caused by vast numbers of insects, as grasshoppers, or reptiles, as toads, which fall into the well, but much more generally they are produced by seepage from commodes or cesspools. These seepages contain the morbid products of septic ferment in such places, with the disease germs from the dejections of any person who may have suffered from any of the zymotic diseases, as cholera, typhoid fever and so forth, which teem with living organisms peculiar to each complaint. It is apparent that well water thus contaminated, must be exceedingly poisonous and dangerous to life, wherefore too much care cannot be taken in locating commodes, not only in reference to distance but also to topography, with the view of preventing the flow of the contents into drinking water. The privy should be at least sixty (60) feet from the well, if the soil be fine and compact; if the deep soil be loose gravel it should be ninety (90) or one hundred (100) feet distant. Often the surface of the ground is such as to indicate the direction of the underground currents; in such cases the building should be so located that the drainage will not flow towards the well. The seepage from porous cesspools into which great quantities of waste water are emptied, must impregnate the ground with organic matter to such an extent that it would not be safe to use the water within one hundred (100) yards of it. I believe that a careful investigation will prove that well water is a source of disease and unfit for use in any town of considerable size in which cesspools are generally employed. In case it be so proven, the wells should be closed by law, and the water supply derived from other sources.

Dr. Austin Flint in his recent paper upon "The relations of Water to the propagation of Fever," says: "The diffusion of typhoid fever by contagion is to be avoided by the disinfection of dejecta from typhoid patients, and by ample protection against the pollution therewith of water or air. The spontaneous occurrence of this disease is to be avoided by complete protection against the pollution of water or air by the dejecta from healthy persons."

The modes by which polluted water is distributed are exceedingly various.

The origin of epidemics of typhoid fever has been traced to water used by milkmen for cleansing cans, and perhaps for diluting milk, which has been proven to be contaminated with disease germs, and thus by the product of a single dairy hundreds of cases of typhoid fever have been sown broadcast; of this several instances are on record.

Even the cool, refreshing lemonade, vended at every street corner during the warm weather, unless made with pure water, may bear disease in every draught. The habit so common to Americans of slaking thirst at the nearest well or pump to the roadside, is one fraught with danger to health, because of the possibility, in some localities, we might say the probability, of the water being unfited for use by its surroundings.

Morbid motes increased by septic ferment and thus diffused into air and water, possess different endowments; as for instance, the fungi of mouldy straw sometimes produce, it is supposed, a disease similar to measles; human excreta cause typhoid fever; the organisms produced by other ferments, or different ferments of the same thing, may induce diphtheria or erysipelas, etc. Diseases contracted in this manner are not uncommonly communicable from one person to another.

Dr. John Simon says upon this subject: "Infections, chiefly known under the names of erysipelas, pyæmia, (pus in the blood,) septicæmia, (putridity of the blood,) and puerperal fever; infections, which we sometimes see locally arising anew in unquestionable dependence on filth, but of some of which, when arisen, it is perfectly well known that they are among the most communicable of diseases. And a further, perhaps still more instructive teaching of the artificial infections is this: That the "common" ferment, which in its stronger actions quickly destroys life by septicæmia, can in slighter actions start in the infected body chronic processes which will eventuate in general tubercular disease."

All contagious diseases have a great affinity for filth, and it is not improbable that they all had their origin in it. It is in loathsome places that they are intensified and grow, and from thence radiate into cleanlier neighborhoods.

None can gainsay the truth that in those portions of cities, towns and villages, where common decency is not maintained by the inhabitants in reference to cleanliness, where the ground is soaked with cesspool seepage, where commodes are built in close proximity to wells, and their contents allowed to accumulate, where slops are thrown into open gutters without drainage, and the dry refuse of the houses is left to decay in heaps, that diarrhœa, cholera-infantum, dysentery, typhoid fever and kindred diseases will there prevail in fullest malignancy; and immorality, poverty, imbecility and deformity are the companion products of these places.

Though man is far in advance in intellect and in physical development, when perfectly formed, of other members of the animal kingdom, yet he has so perverted the endowments of life that few there are who are not born to suffering and early death. The natural term of life is from 75 to 100 years, and every human being ought to be as sure of attaining this age, excepting from the casualities of accident and war, as the shoot of corn is to grow, blossom, bear fruit, and then wither with natural decay.

Dr. Stephen Smith thus remarks: "This science of life reveals to us the stupendous fact that man is born to health and longevity, that disease is abnormal, and death, except from old age, is accidental, and that both are preventable by human agencies."

It is often hard to ascertain in what manner man trespasses upon his own destiny. If it was only through the agency of contagia or septic ferments that the preventable diseases are produced, the reports of vital statistics would shed much light upon it, but hereditary tendency, and the many overdrafts upon "vital expenditure" in the race for wealth and fame, or in the gratification of the passions, render the body an easy prey to disease, and hence it is not always possible to say whether miasma or exhaustion often play the most important part in the production of it.

Again I quote from Dr. Simon:—

"I do not pretend to give any exact statement of the total influence which preventable diseases exert against the efficiency and happiness of our population; for it is only so far as such diseases kill, and even thus far but very imperfectly, that the effects can be represented in numbers. Of the incalculable amount of physical suffering and disablement which they occasion, and of the sorrows and anxieties, the often permanent darkening of life, the straitened means of subsistence, the very frequent destitution and pauperisms which attend or follow such suffering, death statistics, to which I alone can refer, testify only in sample or by suggestion."

It is estimated that of the five hundred thousand deaths that occur annually throughout England, fully one hundred and twenty-five thousand are the result of diseases that could have been prevented by a strict appliance of hygienic knowledge.

This estimate does not include deaths from affections not fully confirmed as belonging to this class, but even omits some of those which our present knowledge leads us to believe have their origin in septic ferments.

Dr. F. W. Draper, in a letter dated Boston, Sept. 25th, 1875, reports as follows:—

"I find some difficulty in determining the exact limitations of the term "preventable," but I presume that sanitarians would generally agree that it might be applied to the class of zymotic diseases at least. The deaths from affections of this class in Massachusetts during the five years, 1869 to 1873 inclusive, (the statistics of later years have not been received,) amount to nearly forty-one thousand, an annual average of more than eight thousand. If we add to this the mortality from acute pulmonary diseases, (bronchitis, pleurisy, pneumonia,) the total for the five years will be over fifty-two thousand. If, again, we add the deaths from phthisis, as Mr. Simon intimates that we may, in our accounts of the controllable filth diseases, the number becomes quite enormous—seventy-eight thousand!"

"The deaths of children under five years old, during the period above mentioned, were as follows: From zymotic diseases, twenty-six thousand; from acute pulmonary diseases, four thousand five hundred; from phthisis, one thousand seven hundred; an aggregate of over thirty-two thousand."

"The total number of deaths in Massachusetts, during the five years, from all causes, was 156,289; of that number the deaths from zymotic diseases comprised twenty-six per cent.; those from acute pulmonary diseases were seven per cent.; and those from phthisis, seventeen per cent. So that, if we include all these among the "preventable" diseases, the deaths from these causes represent one-half of the actual mortality."

The more common of the zymotic or preventable diseases are diarrhœa, dysentery, cholera-infantum, cholera-morbus, Asiatic cholera, typhoid fever, typhus fever, scarlet fever, yellow fever, cerebro spinal meningitis, (spotted fever,) erysipelas, diphtheria, croup, measles, small-pox, syphilis, pneumonia, pleurisy, and many others, among which pulmonary consumption may belong, as above intimated by Dr. Simon.

There is much in the history of diseases in the Great West which leads me to the opinion that pulmonary consumption *should* be added to the class of controllable filth diseases.

Take, for instance, the record of our own city: In 1875 there were registered seven (7) deaths from phthisis as contracted in Denver, although this disease had been steadily increased here since the year 1870; yet prior to that time I had never seen a case which had been incurred in Colorado, nor could I learn of any in the practice of other physicians.

The settlements made in the extreme advance of the march of civilization from the Atlantic to the Pacific were, so far as I have been able to learn, free from pulmonary consumption for a short term of years. It is within the memory of the present generation that the climate of Southern Illinois was much resorted to for the relief of pulmonary troubles. Then in turn came into favor Wisconsin, Minnesota, and the plains of Kansas and Nebraska; now these States and places furnish a fair share of the consumptives who come to this State.

It is an established fact that tubercle is inoculable: If an atom of this matter once introduced into the blood with the point of a lance, will slowly but surely multiply, either in the circulating fluid, or at its point of lodgment, in such numbers as to produce general tuberculization, it is reasonable to suppose that atoms may gain access to the body by other means. The sputa, as well as the excrement of phthisical subjects containing tubercle, are as liable to find their way into drinking water, as the germs of typhoid fever, and may not germs of the former disease, when present in the air, gain access to the body through the lungs or by other means, and increase in the same manner as by inoculation?

W. H. Corfield, Prof. of Hygiene and Public Health, University College, London, claims that the drying of the subsoil by deep drain sewers, has had the effect to diminish phthisis, as well as other diseases, to a remarkable extent, in nearly all of the twenty-five towns in which great sanitary improvements have recently been made. He says that " in Salisbury, Ely, Rugby, Banbury, and so forth, where, as we have already seen, the drying of the subsoil has been considerable, the deaths from consumption have been reduced by a third, or a half their number."

It is an incontrovertible fact that atmospheric influences have a most decided effect upon tubercular deposits in the lungs, either in accelerating their ravages, or in controlling their progress, or even in their eradication. The kind of air generally recommended to consumptives is that which is affected neither by extreme degrees of heat, or of cold, and is free from much moisture,—for damp air is favorable to the life and dissemination of living germs,—or air which is influenced by pine woods, or by the sea, or that which possesses a combination of some of these qualities.

If the humid climates of Illinois and Wisconsin, subject to extremes of heat and cold, and the dryer climates of Minnesota, Kansas and Colorado, have been, for a brief period of time, celebrated for their exemptions from bronchial and pulmonary affections, and for the relief given to those suffering from them, the exemptions and relief could not have been due entirely to equability and dryness of climate, nor the subsequent production of consumption in these localities, due to humidity, or inclemency.

It is not improbable that the cause of the change may have been either the pollution of air, or of water, or both.

Those consumptives who have come to Colorado for the benefits arising from its climate, and have made their residence in the large towns in which no special attention has been paid to cleanliness, have not, as a rule, improved in the same ratio with others who have lived on ranches, or have "camped out" on our sparsely-settled plains, or among our mountains. Instances are not uncommon in which declining health has been changed to convalescence by a removal from the town to the country.

The following simple test will show the difference between the atmosphere of the larger towns, and that of the well-kept ranche five or ten miles distant: If, during the warm weather, two pieces of fresh meat are hung up, one in a cool place in the town, the other in a cool place on the ranche, the result will be that the former will putrify, and the latter will desiccate. The greater putrefactive tendency in the towns is due, I believe, to an increased number of living organisms from septic ferments floating in the air.

In concluding this subject, I must say, that wherever an atmosphere can be found which is nearly free from the motes incident to fixed and close settlements, there pulmonary consumption will rarely be endemic, and there many of those afflicted with it will find relief.

Whether a moteless atmosphere does not contain the material necessary for the origin of tubercle, or the pabulum essential for their rapid growth, I must leave for future investigation to prove, or disprove.

Other things being equal, a dry air is much less liable to bear morbid products, and for this reason, more than for any other, Colorado has undoubtedly attained, and thus long retained, its reputation as a sanitarium.

3rd. Necessary to the preservation of cleanliness in the larger towns and cities, is the adoption of some practical plan for the removal of both dry and liquid refuse, which work ought to be under the immediate charge and direction of the local authorities.

The custom practiced in some towns of notifying the occupants of houses, to clean up their premises and the street and alleys adjacent, once or twice a year, has failed for true sanitary purposes; and the plan of giving the scavenging to some political aspirant, in return for services rendered the party in power, has been attended with no better results.

The offensiveness of filth, and the evils arising from it, with the need of methods for its removal and disposal, must have impressed themselves upon man in the very early ages, for in the American Cyclopedia we read: "The recent discoveries of Dr. Pierotti among the ruins of Jerusalem have shown that the ancient city contained a complex and perfect system of aqueducts, drains and reservoirs. * * * * The discoveries clearly show that the inhabitants of Jerusalem were fully aware of the necessity of speedily removing all decomposable refuse matter." Again: "The necessity of underground channels of this character to the comfort and health of thickly populated places was well understood by the ancient Romans, who, at a very early period adopted a regular system of drainage in their famous sewers." And again: "In America * * * * * the works of the mound builders prove them to have been expert in the building of reservoirs, aqueducts, and conduits; and various places between the northwest and Central America exhibit remains of their sewer constructions."

Dr. John J. Whitty of London, in his report upon the "Water Supply and Sewerage of Jerusalem," says: "Aristeas * * * * describes a vast series of reservoirs beneath the area of the Temple, supplied by a copious spring of living water, and connected together by pipes and conduits extending over a space of five furlongs. There were many openings to these hidden depths from the area above, the secret of which was known only to the ministers of the Temple; and the supply of water was so managed as to flush the whole court, and carry off the blood of the numerous sacrifices." * * * "The Fountain of the Virgin, and the so-called Pool of Siloam were both cesspools; one intended to retain the solid, and the other to receive the liquid, manure cast out from the Temple and perhaps also from the city—from which sewers may likewise have existed, and probably do so still."

The solid contents of the first-mentioned pool, which was the upper one, were allowed to remain until "sufficiently desiccated to be in a fit state for removal by the gardeners who purchased it," while the stream from the lower pool flowed into the King's gardens, "in which it divided into small channels for purposes of irrigation."

As we think of Jerusalem in the time of Solomon, when her water supply was derived in a measure from springs which bubbled up clear as crystal in chambers of masonry many feet below the surface of the earth, and was conducted cool and pure into the city in conduits deeply laid, her system of sewers often tunneled through the solid rock, her final utilization of sewage, and her eternal fire in the valley of Hinnom where the dry refuse was burned, we feel constrained to say with the sacred historian, "Solomon's wisdom excelled the wisdom of all the children of the East country, and all the wisdom of Egypt, for he was wiser than all men."

The great ends to be attained in the removal of filth or sewage, are to accomplish it with celerity, without contamination of air or water, and to deposit it where it can be safely utilized for agricultural purposes.

Among the many plans devised and employed, none have accomplished the work without many objections. If the old system of privies continues in use, as it probably will on the ranches and in the small towns and villages, the vaults should be made water-tight, so that the liquid contents, cannot seep into the drinking water, and, for fear of accidental leakage, should be located as before mentioned.

Disinfection should be frequently made, with crude carbolic acid, chloride of lime, sulphate of iron, and so forth. Coal oil is better than no disinfectant. These vaults should be cleansed as often as once in every three months, and it should be done, in my opinion, during dry weather when the sun is shining brightly; for the dampness of night,—the time usually taken for this purpose,—favors the spread of the dangerous emanations, which thus attack human life when it is at rest, and when it possesses the least capability of resistance.

The place where slops are thrown or drained, should be as far from the house and well as the commode; and as often as it becomes offensive, the ground saturated with grease and other organic matter, should be removed for agricultural purposes, and replaced with dry earth.

Dry refuse should be utilized, or removed, and not allowed to decay near the dwellings. Parings, vegetable tops, crusts, etc.,—can be cooked for the poultry, or saved for the cow, while bones and such substances as are useless should be burned, or cast into the ash-pit, and thence ultimately removed.

The dry earth or ash commode system, in which the excrement is deposited into a chamber of metal or masonry, from which its removal is easily accomplished, is attended by many inconveniences; carelessness of the user in applying soil or ashes in sufficient quantites, over-accumulation of contents, want of care in removal, and so forth. Although the agricultural value of the compost is considerable, the expenses incidental to the use of earth closets, and the great vigilance required in their management, in keeping them inodorous, and from becoming mud-pits, and sources of disease, overbalance their agricultural worth. Furthermore, slop-water is left for other means of removal. Notwithstanding these objections however, this plan is perhaps best suited to towns of medium size, which lie too flat for underground drainage.

The plan so commonly adopted in Colorado, of using deep and porous cesspools which only retain portions of the solid matter emptied into them, the fluid and semi-fluid contents seeping into the ground, is open to greater objections. The soakage from them causes pollution of the soil, and from this, pollutions of water and atmosphere inevitably follow.

The custom so often resorted to in Denver, of constructing cemented, impervious cess-pools, the contents of which are removed by the odorless excavator, is, in a sanitary point of view, far superior to the other two methods mentioned, but attended with incredible expense.

The costs for a population of 20,000 inhabitants are estimated as follows; one cess pool would be required for every five (5) persons; this would necessitate the construction of four thousand (4,000) cess-pools at an average cost of sixty dollars ($60) for each, or a total cost of two hundred and forty thousand dollars ($240,000). The expense hardly commences here. Allowing fifteen (15) gallons of sewage for each individual daily, (which is below the general waste,) the total amount would be three hundred thousand (300,000) gallons. The receiver of the odorless excavator contains about eight hundred (800) gallons, and the actual cost of filling it and removing contents out of the city is about two dollars and fifty cents ($2.50) for each load. This would make a daily expense of over nine hundred dollars ($900,) or a yearly expense of three hundred and thirty thousand dollars ($330,000). If the full sum be charged, as allowed by a recent ordinance of the City Council, thirty dollars ($30,) per load, the daily cost would reach eleven thousand two hundred and fifty dollars ($11,250,) and the yearly, four million six thousand two hundred and fifty dollars ($4,006,250).

The water carriage system, so familiar to almost all of the civilized world, is far from perfect, but possesses fewer objections than any other method devised by man. This plan is only feasible where the supply of water is abundant, and where there is an incline sufficient for natural drainage, or drainage by flushing.

It consists of impervious underground conduits, or pipes, which conduct sewage to one or more places of discharge, away from the inhabited portions of the city.

For thorough and very interesting information upon this subject, I append a letter from Mr. Harvey C. Lowrie, City Engineer of Denver.

OFFICE OF THE CITY ENGINEER,
DENVER, November 15, 1876.

To the President and Members of the State Board of Health:

GENTLEMEN:—At your request I herein present, to accompany the report of the President on the sanitary needs, a few general statements in regard to the usual modes of constructing sewers and the practicability of their operation in this State. What I shall say will comprise nothing new to those at all familiar with the subject, and if it shall cover the points at issue I presume it will be fully as acceptable as would a much more extended article containing many copious quotations from eminent authorities, and to the same end.

THE CONSTRUCTION

Of an efficient system of sewerage, I will say, under favorable circumstances as to materials, labor, and the position of the area to be drained, is not one of very much complication in the case of a town or city which has not as yet built any sewers. The more difficult questions in sewerage construction arise in those cities which have constructed sewers by piece-meal, in different localities, without regard to a general system, and also in those cities in which they have been constructed on a system which by the wants of a rapidly increasing population, is proved to be insufficient. It is in such cases, where is demanded a plan that shall reconcile and utilize, as much as is possible, the ill-directed works of the past, that questions of complication in the construction of sewers arise and demand the highest degree of talent in the engineering profession. In the case of a city which has yet to lay the first foot of sewer the task is comparatively simple, although the greatest care and the constant exercise of good judgment should be used to determine upon and adopt such a system as shall be effectual and adapted to enlargements to meet the wants of the city for all time to come.

THE MAIN POINTS

To be considered in devising an efficient system of sewerage, are included under the three general heads following, viz:

1. The proper location of the main sewers to be first constructed, with regard to the amount of area to be drained and its inclines—the location of branch sewers and other mains, and the present and ultimate point of discharge.

2. The proper size, grades, materials and modes of construction of the main and branch sewers, with regard to existing conditions as to area of the district to be drained, the lay of the same, the available supply of water for carriage and flushing purposes, the resources and cost of labor and material at command, and a mode of ventilation.

3. The best system of connections for joining different lines of sewers, of traps for preventing the escape of noxious gases, of inlets and outlets, catch-pools, man-holes and minor incidental appurtenances.

With regard to each of these points the problem is not so much one requiring the study incidental to the solution of a very difficult question, if the local conditions be favorable, as it is one that requires careful attention and consideration. The main sewers of a town or city should be distributed according to the physical formation of the ground, so that by lateral branches the whole may be readily reached by drains, and especially with a view to a point of discharge which shall always suffice, due allowance being made for any possible growth of the place, This latter consideration, a most perplexing one in inland and sea-coast cities, where the land to be drained in many cases lies very near the level of the only practicable point of discharge, will not, I think, prove a difficult point here in Colorado, owing to the variety of surface presented, not only near our mountain towns, but also by the rolling character of the land on which are built most of those on the plains. Indeed, upon the sites of some of our Colorado towns, nature has plainly indicated the only practicable courses and modes of discharge, with regard to the lay of the land. Under the second division I have made, come questions of

DIRECT LOCAL IMPORT.

As a general rule, the sewers of American and European cities are constructed of brick, stone-ware pipes being used to a large extent for smaller sized sewers and for house drains. The bricks generally used throughout this state for building purposes, while they answer that end admirably, are of a character entirely too soft for use in the construction of sewers, in which to resist the action of friction from rapidly passing contents, the acids and gases generated by decomposed sewage matter, the attacks of rats and the disintegrating effects of a state of constant moisture, is required the very best description of hard burned clay bricks, carefully laid in cement. The scarcity of accessible deposits of clay in this state will make the desirable kind of brick exceedingly costly in many localities, which are remote from such points. Stone, of which we have a great abundance in good quality, would undoubtedly be a permanent and satisfactory material, but the cost of it in place would also be excessive. Cast-iron pipes of very large diameter are now being used, and, I think, with success. Probably the best material within our reach, at the present time, at reasonable figures, is stone-ware made of hard burned and well vitrified clay. This can readily be obtained at eastern factories or, I presume, can be manufactured in our own state when a demand shall be created sufficient to warrant it. There is a great difference in the quality of stone-ware, and only the most approved grade should be used.

STONE-WARE PIPES FOR DRAINAGE

Are made in sections, straight, curved, elbows, junctions, etc., in size varying from three to thirty inches in diameter. The ends join in sockets which, by the use of hydraulic cement, may be made perfectly air and water-tight. The bore is too small and too smooth to admit the retention of sewage matter, and it is therefore swept away so rapidly as not to admit of the production of any great amount of foul gas by decomposition of accumulated sewage. It, moreover, will not admit the escape of gases or the action of rodents to the same extent that brickwork will. It seems to me that a very good plan for most of our towns would be to lay stone-ware pipe, with connections provided at every point it may be thought it will hereafter be necessary to tap the sewer, for a branch or connecting pipe—say opposite each lot front, in the thickly built portions of the town—at the time of construction, together with suitable brick catch-pools at the corners of the streets which, covered by a grating, will admit the wash of the street to flow in and which will retain in the bottom the earth and sand while the water flows to the sewer by a lateral pipe. Also, should be added at intervals, brick shafts—man-holes—through which the interior of the main pipes may be inspected and the place of any trouble in the workings at once detected and located. Such a system, with an abundance of fall and water for carriage and flushing purposes, would, I think, answer most of our young cities for years to come, at a comparatively small expense. At least it might safely be tried by laying pipes to such an extent and in such locations as will answer present purposes, and will not be likely to prove incompatible with later additions upon the same or a more approved plan. Any description of sewer

SHOULD BE LAID VERY CAREFULLY

And, to a certain extent, with skilled labor. This we have in abundance and at low rates. In places, the treacherous character of the soil will call for the most careful exercise of judgment in forming reliable foundations. Of course, if the requisite grades can be obtained by so doing, economy in the items of laying sewers, and of repairing them in the future, will require that they be laid at a nearly uniform distance below the grade of the streets, and no deeper than is necessary to secure effective drainage of adjacent cellars, vaults and the subsoil.

The size of the sewers is a point to be determined by careful calculations, with regard to the material to be used, the grades and the area to be drained. The more ordinary dimensions, however, are in stoneware, round pipes from ten to thirty inches in diameter. In brick, of egg-shaped pattern — the most approved form — from two and one-half to seven or eight feet in depth. The minimum inclination allowable is an item to be determined chiefly by the existing conditions of the area to be drained. It can rarely be made too great, and if the district to be sewered is deficient in fall, an increased size of mains will be necessitated, sufficient in any event to give a velocity of at least two feet per second, and this, too, with an abundance of fluid contents for flushing. Indeed a liberal supply of water forms an almost indispensable adjunct to any satisfactory system of sewerage, especially in a country of so little average rain-fall as this. Allowance must also be made for the extraordinary amount of rain-fall we are occasionally subject to, if it be desired to carry this in the sewers. The greatest amount of rain-fall in the east has never exceeded two inches in an hour, or 54,308 gallons. We have had heavier falls than that here, and in some localities a very large per cent. of the fall will undoubtedly reach the drains, when constructed, within a very short time. However, there has rarely been a fall of rain known to the United States signal observer at this place which amounted to one inch in depth upon surface, per hour, and it is only a very violent storm that will produce that. To give you a general idea of the capacity of sewers to carry water, I quote here from Haswell, that a circular sewer of two and one-half feet in diameter, with an inclination of one foot in sixty, will discharge water equal to one inch in depth upon the surface per hour of 182 acres of land, including ordinary city drainage.

EFFECTIVE VENTILATION

Of sewers is the most imperfectly attained of any of the desired ends. Various expedients, ranging from the simple experiment of forming connections with chimney flues of private houses and factories, upward to costly and complicated combinations of specially constructed chimney-stacks, blowers worked by engines, and the like, have been proposed and many of them tried, with very little good effect. I am of the opinion that, with the abundance of fall generally to be obtained in Colorado towns, a systematic closing of all apertures in the sewers by traps, that will as nearly as is possible prevent the escape of gases and odors into the houses and streets, together with a thorough flushing of all the sewers at least once in every twenty-four hours, which will remove the sewage matter before it will have time to throw off much gas, will prove the best mode of ventilation practicable, and a very good one too. Here again the argument is in favor of stone-ware pipes, through which, it is reasonable to suppose, a comparatively small supply of water will rush with great velocity, completely filling the sewer, carrying all sewage matter before it and creating a partial vacuum of air behind it that may greatly serve to draw again into the sewer noxious gases that have already escaped to the more elevated house drains, ready to pour into the dwellings upon the first opportunity. Whatever material be used, however, the sewers should be constructed of such sizes, shapes, and on such inclinations as to be perfectly self-cleaning. The subjects under the third head of the divisions I made at the beginning of this paper are such as depend entirely upon the system that may be adopted. This is an age of progress, in which old and time-honored appliances, as well as usages, must give way to later and better inventions. The *dictum* of text books, in regard to mechanical appliances, must be very recent to be weighty with the practical man of to-day. Consequently I should say, in considering any system of sewerage, descriptions of the best forms of the minor appliances should be made by detailed drawings, based upon the nature of the case and the successes and failures of as many progressive cities of large sewerage experience as can be readily observed.

DISPOSITION OF SEWAGE MATTER.

Directly incidental to the construction of a sewer, is the question of the final disposition of the sewage matter, and it is nearly always a vexed one, sooner or later. It is but rarely that the plan of discharging it into water, however deep, is more than a temporary relief. At best it answers only until a population extends along the river made unhealthy by the filth from above, or by the sea coast washed by the garbage-laden waters of the inflowing tides. Various attempts have been made to utilize sewage matter as a fertilizer in a concentrated solution or as a solid. I know of no place where it is now successfully practiced. Another method, and the one I think the most practicable in many parts of this state, which certainly is peculiarly adapted to it, is the conveying of the sewage into the irrigation ditches. Certainly the waters of the streams of Colorado, so few in number and so much relied upon for domestic and stock purposes, *should be preserved in their* purity as much as is possible, for all time to come. In rapidly growing towns the construction of sewers is often delayed until the subsoil is so thoroughly saturated with disease-breeding filth that no subsequent efforts will suffice to remove it. It occurs to me that the legislature of a State, which is supposed to protect the life, liberty and happiness of its citizens should, in chartering new towns or cities, make some proviso in the charters that will insure a proper drainage of all towns as they are built, based in some way, as to amount, upon the population and its growth. In conclusion, let me add, I hope that these general remarks upon the subject of sewerage construction and items incidental, will be thought by you to meet the want which prompted the request for them. I expect to devote considerable time to this subject this winter, for the purpose of perfecting a complete and detailed system for the use of this city. Such of you, or any citizens of the State, who may take sufficient interest in the question as to call and personally examine results, will be cordially received.

Very respectfully submitted, HARVEY C. LOWRIE.

The evils arising from sewers are generally caused by imperfections in the house and soil pipes. There should always be two traps—one in the house and one in the soil pipe—and a good incline. Ventilation and frequent flushing of sewers are necessary to prevent the escape of gases through these pipes, no matter how well trapped they may be. Too much care cannot be exercised in the laying of these pipes through dwellings; the escape of gas from their faulty construction or arrangement renders all who breathe it liable to attack from some form of zymotic disease; and the leakage of sewage from soil pipes, by saturating the ground, would induce miasma, and be attended with the same results.

Perforation of the pipes is sometimes caused by the corrosive qualities of sewer gas. Dr. Fergus, of Glasgow, who has given much attention to this subject, says: "The practical sanitary conclusion which it concerns us all to keep in mind is, that any house, no matter how carefully or well built, may become unhealthy from this source, and that when cases of typhoid fever, diphtheria, etc., occur, the pipes should be thoroughly inspected, especially under their upper surface, and the whole of the soil pipe uncovered. I must strongly insist on this, as in many cases the plumbers have declared pipes to be all right which turned out to be very defective when uncovered. For some years back I have insisted on a careful examination of the soil pipes whenever I have had cases of typhoid or diphtheria, and in every case where I could get this carefully carried out, I have detected these perforated pipes, or sewer air getting into the houses in some other way."

4th. The last topic of our subject, the final disposal of filth, now claims our brief attention. As the best apparent mode for its *removal* in Colorado seems to be by the underground water carriage system, we will consider its *final disposal* in the shape of sewage matter alone.

The great aims in the treatment of sewage are prevention of its pollution of rivers, and its utilization for agricultural purposes. For this end different plans have been devised: Simple filtration, the many different processes of precipitation which have been so thoroughly tested in Great Britain, and irrigation.

The last of these methods is perhaps the one best suited to a country like Colorado, in which an artificial supply of water is necessary for the growth of crops. The slope of the whole land is so great that there is scarcely a town in which the main sewer could not be made to discharge its contents into an irrigating canal. There may be places in the mountains in which the land requiring irrigation would be limited. Upon this matter I quote the authority of J. Bailey Denton, of England, whose experience as principal engineer to the General Land Drainage and Improvement Company for upwards of twenty years makes his opinion valuable: "With free soils, one (1) acre will suffice to cleanse the sewage of one hundred and fifty (150) persons; though, if we look to profit as the governing object, the same quantity of sewage will fertilize three (3) acres, and perhaps more. Under the same conditions, one (1) acre of what are called retentive soils may be so under-drained and surface-cultivated as to cleanse and turn to the best profit the sewage of one hundred (100) persons."

In relation to the value of this refuse for fertilizing purposes, we learn from the experiments of a Mr. Thompson, in Lancashire, who "tried eight (8) tons of sewer water upon one acre, and fifteen (15) tons of ordinary farm-yard manure upon another; that the produce of the former to the latter, was in the proportion of 1.875 to 1; or comparing the produce of each with the *weight* of the manure, the proportion stands thus: 1.875 of the former, to .532 of the latter; or nearly four to one."

From the experience of other cities in which the plan has been in successful operation for years, we can learn much, but it will be sufficient here to give only one instance, quoted from Mr. Whitty's work before mentioned: "The sewage of the City of Milan is collected in two concentric canals, and then poured into another canal. Along its course, large extents of meadow ground are irrigated, by the liquid from the sewage being permitted to flow over them; and the deposit, which must occasionally be removed to prevent the ground rising above irrigation level, possesses such valuable fertilizing properties, that it is eagerly purchased as manure by the neighboring agriculturists. Some of the meadows irrigated by the sewage of Milan produce a net rent of £8 per acre, independent of taxes, and are mowed in January, March, April and November, as fodder for cattle; besides which, they produce three crops of hay in the year; one in June, another in July, and the third in August; and in September they afford excellent pasture and grazing land, 'till the season for fresh irrigation, in winter commences."

As our State is in its infancy, and, in a great measure, free from the mistakes and blemishes of older countries, let us try to have her grow up under as nearly perfect sanitary rules as our present knowledge upon this subject can form, for from public health alone can come morality, prosperity, and long life.

I have not, I am well aware, presented this very important subject with the thoroughness which its value demands, but it is impossible to do so in the scope of a single paper; it is a matter that requires volumes in space, and years of thought, study and experience, to ensure a comprehensive and just digest of its wide-spreading necessities. But if I have suggested sufficient to arouse more active and general attention than has yet been accorded to the many duties and dangers pressing upon us as a people; if, in the public mind, there be aroused a practical antagonism to filth, and a check be given to the ravages of the preventable diseases, I shall be well-satisfied with the result of my effort, imperfect though it be.

REPORT

ON

The Mineral Springs of Colorado.

BY T. G. HORN, M. D.,

Member of this Board.

MINERAL SPRINGS OF COLORADO.

The mineral quality of certain springs in many parts of the "Old Country" was well known and understood by the ancients. We have only to refer to ancient records to prove the value placed upon them by the vast multitudes who yearly flocked to them to obtain the benefit derived from them on account of their health-giving qualities. And even to the present day they are favorite resorts. The United States are known to contain mineral waters of great value. In 1872, Dr. Geo. E. Walton, of Cincinnati, Ohio, made a report to the Medical Association of the State of Ohio, on "Therapeutics of Mineral Springs," in which he gave, so far as was at that time known, a complete history of all medicinal springs, together with the correct analysis and location of each. This report has been published in book form, revised and enlarged in 1874, and is now a work of great value, and should be found in the library of every physician in our country. At that time there was but little known in regard to the "Mineral Waters of Colorado." Thus we find at the present time but little written upon the general beneficial effect of our valuable springs. Colorado, with its climate unsurpassed, mild as the Italian atmosphere, purified by the electrical current until it rivals the crystal streams that flow down the mountain gorges; scenery whose grandeur is surpassed alone by Him who created it, and last, but not least, her "Mineral Waters," with which she so universally abounds, seems to have been intended by the great Ruler and Creator of the Universe, as the great natural "Catholicon" for diseased humanity. Much has been written about the medicinal effect of the mineral waters of the "United States." Comparisons have been made by correct analysis with springs of known value in foreign countries, but none have come so near equal to the most valuable of them all as those now known to the profession in this State. Unfortunately, at this time, there are but comparatively few that have been properly tested so as to give the true analysis; and many have but lately been discovered whose "mineral qualities" have only been tested by the positive cures produced by them. What we mean by "Mineral Water" in contradistinction to other water, is a water holding in solution different saline and gaseous substances. A "Mineral Water" then, in the medical acceptation of the term, is one which, by virtue of its ingredients, whether mineral, organic, gaseous, or the principle of heat, is especially applicable to the treatment of disease. As water falls from the clouds in the form of rain, it absorbs various gases, so that when obtained in this purest natural form, it contains nitrogen, oxygen, carbonic acid, and often traces of carburetted hydrogen, nitric acid, or ammonia. Having fallen upon the earth, its solvent power causes it to take up various salts and organic substances from the soil, so that when taken from rivers it frequently contains several grains of solid constituents to the gallon, or as much as a grain to the pint.

The following table will show the amount and number of these constituents to the pint in two rivers (the Schuylkill and the St. Lawrence) by L. Sullivan, Jr., and T. Sterry Hunt, and will also show the quantitative and qualitative differences when compared with the "Mineral Springs" of our State, so far as we have made careful analysis of the latter.

SALINE. One Pint Contains: *Solids*:—	SCHUYLKILL, By L. SULLIVAN, JR.	ST. LAWRENCE, By T. STERRY HUNT.
	GRAINS.	GRAINS.
Carbonate of Soda, ...	. . . .	0.007
" " Magnesia, ...	0.044	0.026
" " Manganese, ...	. . . .	. . . .
" " Lime, ...	0.234	0.084
Chloride of Potassium, ...	. . . .	0.002
" " Sodium, ...	0.018	0.003
" " Magnesium, ...	0.001	. . . .
" " Aluminum, ...	. . . .	. . . .
" " Calcium, ...	. . . .	. . . .
Sulphate of Soda, ...	. . . .	0.018
" " Magnesia, ...	0.007	. . . .
" " Lime, ...	. . . .	. . . .
Phospate of Aluminum, ...	. . . .	. . . .
Silica, ...	0.010	0.038
Oxide of Iron and Manganese, ...	. . . .	Trace.
Alumino Phosphoric Acid, ...	. . . .	Trace.
Salts of Soda, with Nitric and Organic Acid, . . .	0.206	. . . .
Total, ...	0.520	0.178

The origin of springs has been a subject of inquiry by philosophers of all ages. We have Aristotle's views, who believed that large caverns in the interior of the earth were filled with air which, at the roofs, was condensed to water by the cold, and thus made way to the surface of the earth by various outlets. Descartes, who was fond of new theories, gave it as his opinion that immense caverns existed in the interior of the earth, into which water flowed from the sea; there this water was converted into vapor by the interior fires that existed, ascended to the upper part of the caverns, and by the low temperature, was condensed to water; thence the water was forced upward through the crevices in the rocks and escaped as springs. Since that time Marrietta and Holley have given a theory which is generally accepted, depending upon rainfall, including snow and dew—promulgated by each about the same time—proving these to be sufficient *to supply all the water that* flows from rivers and springs. But many of these springs contain ingredients in large quantities not found in rain water or sea water. Whence and how do they obtain these constituents? Pure water possesses a solvent power unequaled by all other fluids. Rocks, glass, and all other solids are affected more or less by its continued action, and by the addition of carbonic acid gas, its solvent power on many substances is greatly increased. Permeating as it does, not only every fissure of the earth, but the solid rock, collecting in mines, dripping from roofs of caves, etc., it is not surprising to find it containing large amounts of ingredients, when it has passed through thousands of feet of dense rock, occupying years or centuries, it may be, in its passage. And again, if this stream thus impregnated, becomes imprisoned between almost impermeable strata, it will flow onward till a fissure in the overlaying strata is found, when, by hydrostatic pressure, it is forced upward and bursts from the earth as a mineral spring.

The same phenomenon is presented in Artesian wells, causing an outflow of water projecting at times several feet above the earth. Dr. Walton, to whom I have referred before, (from whose work I have gained much information, and by whose permission I quote,) gives an excellent illustration of the condition under which mineral springs occur in Saratoga county, New York: "The geological strata of this county from above downward are as follows: 1st. Hudson river and Utica shales and slates. 2d. Trenton limestone. 3d. Calciferous sand-rock. 4th. Pottsdam sandstone. 5th. Laurentian formation of unknown thickness."

"The Laurentian rocks are composed of highly-crystalline gneiss, granite and syanite, and are almost impervious to water, while the Pottsdam sandstone and Calciferous sand-rock, immediately overlying, permit it to pass freely. All the rain falling (except that which passes off as surface water) permeates the different strata till it reaches the Laurentian rocks; thence it passes over these rocks until a fissure is reached, where it comes in contact with the uplifted ledge of rocks and accumulates. From the fissure in the Laurentian rocks, which penetrates to an unknown depth, carbonic acid doubtless arises, and thus, in addition to its mineral ingredients, the water becomes highly charged with gas. The continual accession of water and the pressure of the gas together, force the water to the surface, where it breaks forth in the various springs of Saratoga valley."

So far as we can gather from geologic data, this is true in regard to our springs. In several instances (as we shall show more clearly in describing certain springs) we find hot and cold, mineral and pure water, springs in close proximity, showing a well marked example of what is known as the *ascending* springs, or those in which the water is elevated from a point below by hydrostatic pressure.

As examples of *descending* springs, the world can produce no better than our mountain districts; but seldom are they of such qualities as to classify them with the mineral waters, but they produce the purest drinking water. The water which they emit is the result of rain, snow, or ice which falls or forms on the mountains. As a good example of a descending *mineral* spring we take the Rockbridge Alum springs of Virginia. This spring issues at the eastern base of a mountain ridge, which rises almost perpendicularly above. The water collects in a large reservoir of clear shale; this shale, on analysis, yields constituents similar to those found in the spring water, that is sulphate of iron, alumina, sulphuret of iron, etc. The direct origin of these springs, from the descent of rainwater through the shale, is fully proven by the variable flow. In rainy weather there is an abundant flow, and during the dry seasons the supply is much less. The physical characteristics of mineral water differ in many respects from ordinary water, in taste, odor, color, temperature, texture, elasticity, magnetism, etc.: all of which are well known and understood by the people as well as the profession, and therefore I will refer only to one, viz: texture. This term when applied to water is intended to represent the sensation of harshness, or smoothness, which it imparts when it comes in contact with the skin. It is only when the feeling is peculiarly bland and soft that it has been noticed. While bathing, the whole surface of the body presents the appearance of having been oiled. The "Hot Springs" of Cañon City are possessed of this quality. We will refer to this again more particularly when describing the springs at that place.

Prof. Kastner has demonstrated very conclusively that hot water, and water containing a large proportion of saline ingredients, conducts electricity more readily than pure water.

Much has been said and written in support of the medicinal and curative properties of *all* mineral waters.

All owners and proprietors of mineral springs are loud in professed cures of the worst form of disease; long advertisements with certificates attached, are sent out all over the country, and many a poor sufferer has been caught by the wily bait so adroitly set for him. The most of *our* springs have the advantage of all other springs in the United States on account of locality; Colorado being known, and universally acknowledged to be the safest and most natural resort for the invalid, on account of its altitude, pure air, dry climate, and the surrounding beauties with which nature has adorned her. With these advantages the mineral springs of Colorado *must* become the most popular and most beneficial of all others in the United States.

"In order to make a proper application of mineral waters to the treatment of disease, a classification becomes necessary." "Several methods have been given; some from their geological origin, their geographical location, their therapeutical action, and their chemical constitution." *Our* springs are not well enough known to follow any particular classification; but few have a true analysis, and many are but recently discovered. Some are known only on account of the positive cures which have taken place by their use; a fair example of which are the sulphur springs of Middle and South Park, and Wagon Wheel Gap, of which I will give a statement and evidence when describing the locality and medicinal virtue of each.

The German and French classifications are objectional in many particulars.

"In the chemical classification all *sulphates* are classed together, whether purgative or not, ignoring the thermal waters as a class. In the German we have the Glauber salt and the Epsom salt separated into distinct classes, both being purgative waters."

In carefully comparing all classifications at my command, I have selected Dr. Walters as the best, because it partakes both of the chemical and the therapeutical systems.

CLASSIFICATION.

I. ALKALINE.	1st. Pure.
	2d. Acidulous. (Carbonic Acid.)
	3d. Muriated. (Chloride of Sodium.)
II. SALINE WATERS. . . . (Chloride Sodium.)	1st. Pure.
	2d. Alkaline.
	3d. Iodo-Bromated.
III. SULPHUR WATER. . .	1st. Alkaline.
	2d. Saline. (Chloride of Sodium.)
	3d. Calcic.
IV. CHALYBEATE WATERS.	1st. Pure.
	2d. Alkaline.
	3d. Saline. (Chloride of Sodium.)
	4th. Calcic.
	5th. Aluminous.
V. PURGATIVE WATERS. .	1st. Epsom Salt. (Sulphate Magnesia.)
	2d. Glauber Salt. (Sulphate of Soda.)
	3d. Alkaline.
VI. CALCIC WATERS. . . .	1st. Limestone. (Carbonate of Lime.)
	2d. Gypsum. (Sulphate of Lime.)
VII. THERMAL WATERS. .	1st. Pure.
	2d. Alkaline.
	3d. Saline. (Chloride of Sodium.)
	4th. Sulphur.
	5th. Calcic.

In explanation of this classification the Dr. says: "The waters of each class have a similar action, varied, however, by minor differences, which are, to a considerable degree, indicated by the sub-divisions."

It is difficult, sometimes, to determine to which class a spring belongs, from the fact that none of its ingredients especially predominate. Waters included under the sub-divisions "pure," are only comparatively so, the ingredients, other than those distinctive of the class, existing in minute proportions. Thus a pure alkaline water may contain large quantities of the alkaline carbonates, but it can only contain very small proportions of chloride of sodium or other salts.

The class "Thermal Waters" may embrace those agents which, as to their chemical constituents, belong to one of the other classes. The action of such waters, aside from their thermality, is indicated by the sub-divisions to which they belong. It is rare, however, for thermal waters to contain a large proportion of mineral ingredients.

ACTION OF MINERAL WATERS.

Many persons visit our country, not on account of some specific disease or ailment they may have, but for rest, change of air, scenery, and every day life. Many from the crowded cities, or close confinement to business for years, seize the first opportunity, during the warm weather, to escape to the mountains, spending most of their time out doors, and what is the result? How many return to their homes restored to health, fresh and vigorous, perhaps in better general health than for years? The mineral water had nothing to do with these results, and just here we find the greatest difficulty in arriving at the real value of the use of medicinal waters. Change of air, we all know, has a most remarkable effect in many cases and various diseases. For instance, we see the subject of asthma—one of the most distressing diseases known to humanity,—relieved the moment the patient reaches this State. The influence of the mountain air *cannot* be too highly estimated. Consumptives frequently gain from the time they arrive. Dry walking, clear sky, tonic air, all aid in restoring the weak constitution to its natural healthy condition. Change of scene is another agency in this great work, and no country can compete with ours in these auxiliaries.

The most of our mineral springs are located in beautiful places, easy of access, surrounded with the grandest scenery known to mankind. It is impossible for us to say *how* mineral waters act, yet this is no objection to their use, for how many drugs do we use daily without a knowledge of *how* they act? yet they *do* act, and just as we want them.

Another objection is, that like patent medicines, they are highly recommended for *all* diseases that humanity is heir to, while ignorance prevails as to their composition.

This may be true in some degree, but while it is a fact that the medicinal virtues of many springs are overestimated by owners, and that they *do* contain elements unknown to the profession, they are in no way more so than many of our best remedies of the present day.

Previous to the present century the active principle of no vegetable drug was known, and yet they were used with as much benefit as at the present time. Many of our mineral springs have but recently been discovered, therefore few have been properly developed, and in many instances correct analyses have not been made, yet some of the most aggravating diseases have been positively cured by the use of their waters.

"The action of mineral waters may be divided into *immediate* and *remote*." "The immediate action is that which results within twenty-four hours after it is taken. It may present as a *stimulant* or eliminant, according to the constitution of the water. The first impression of a mineral water is that which is exercised upon the stomach. Waters cold in temperature, containing considerable carbonic acid gas, and alkaline in constitution, will prove sedative, both to that organ and the arterial system, while hot waters, and those highly charged with sulphureted hydrogen, will prove stimulant. Some sulphur waters, containing considerable organic matter, are decidedly sedative in action, reducing the frequency of the pulse. The eliminant action results from the effect of the waters on the intestines, kidneys and skin. Waters containing chloride of sodium, sulphate of soda, or sulphate of magnesia, in large proportions, act readily on the bowels. The alkaline and calcic waters prove diuretic, some of them stimulating the kidneys in a marked manner."

"Certain waters are cathartic or diuretic, according to the mode of administration. Thus, a water containing a comparatively small amount of purgative salts, with other constituents, such as sulphate of lime and carbonates, will prove actively cathartic if taken in doses of two or three glasses before breakfast; but, if the same quantity be equally distributed through the day in small portions, it will produce a copious flow of urine, while the intestines will be unaffected."

Pure water, when taken in large doses, will produce diaphoresis, yet, there are some mineral waters that effect the integumentary excretions in a more marked degree. We have a good example of this class in the sulphur springs of *Middle* and *South Park.*

The state of the atmosphere has much to do with the action of mineral waters, of course; if the temperature be high it will be promoted, and retarded if low. When applied externally they act as a stimulant or sedative. When possessed of large proportions of carbonic acid gas, they act as a direct stimulant to the skin. The springs at Manitou are a fair example of this class.

But the most important effect of most mineral waters is their *alterative* action upon a large proportion of diseases, especially rheumatic, venereal, and *all* forms of skin, disease. Although *all* mineral waters produce an alterative action, yet there is a wide difference in this action, as to its results, in the various waters. "The alterative effect of different classes of waters varies, just as the alterative action of iodine, arsenic or mercury." Each acts in its proper way on the blood and tissue. For instance, alkaline waters reduce the fibrin of the blood; saline waters act on the glandular system; sulphur water on the skin; chalybeate waters effect the red globules of the blood, and so on.

In this way I might take up all the ingredients contained in the waters now known to us, and show their effect upon the system in eliminating disease, but I think the above sufficient in the present report. I shall now proceed to a special description of springs, as to locality, so far as my limited knowledge will permit.

I am sorry to say that I was unable to obtain as much information relating to our mineral springs as I desired; but few persons answering my inquiries, and many of the replies received containing local prejudice, and there being so little published matter relating to the subject, necessarily *this* report *must* be imperfect. As before stated, our State abounds with mineral springs, and that of the most beneficial known to humanity. Add to this our pure mountain air, our beautiful scenery, level roads, cool, refreshing nights, and we can only conclude that God, in his wisdom, created Colorado and endowed her with all the prerequisites to make her a paradise for diseased humanity: for young as we are, and as little as we now know in regard to the curative effect of our springs water and climate, yet there is no part of this State not especially adapted to the relief of some particular disease. But I pass to a consideration of

IDAHO SPRINGS.

For a description of these springs and locality I an entirely indebted to the kindness of Dr G. S. McMurtrie of Central City, who formerly lived at the springs. And as his letter is full of interest, and free from prejudice, I will give it *verbatim*:

"The warm springs of Idaho, Clear Creek county, are situated along what is known as "Soda Creek," emptying into "South Clear Creek," about nine miles west of the "Junction" of the C. C. Railroad, and three and a half hours from Denver, westwardly."

"The region about it is remarkable for its quiet beauty. The lofty mountains of the Old Chief, Squaw, etc., on the south, the bold ridges separating it from North Clear Creek, the beautiful ranches of Chicago Creek, with the lovely green of the whole prospect, render Idaho Springs certainly one of the most attractive spots I have ever visited."

"The natural attractions of the place are not materially lessened by a first-class hotel, thoroughly conducted."

"The atmosphere is peculiarly soft and delightful at all seasons, compared with that of most points to the north and west. I ought to mention that several cottages, separated from the hotel, are at the service of invalids and other visitors."

"The springs are alkaline in character, containing carbonate of soda, but I send you a card with analysis, which reads as follows:"

IDAHO HOT SODA SPRINGS AND MINERAL BATHS.

The medicinal properties of these waters may be determined from the following analysis. (Name of the author not given.)

One gallon contains:

Carbonate of Soda	30.80
Carbonate of Lime	9.52
Carbonate of Magnesia	2.88
Carbonate of Iron	4.12
Sulphate of Soda	29.36
Sulphate of Magnesia	18.72
Sulphate of Lime	3.44
Chloride of Sodium	4.16
Chloride of Calcium and Magnesia, each	Trace
Silicate of Soda	4.08
Total in grains	107.00

"And in addition to this there is an excess of free carbonic acid. They range from 70° to 110° Fahr. at the point of emergence, and are tempered to any desirable point in the baths by the admixture of the clear water of Soda Creek. The baths are remarkably soft and cleansing, the skin being left soft and pure after a very few minutes immersion. These baths I know to be of service in cases of chronic rheumatism, and in early stages of desquamative nephritis. Not that I would claim any very decided medicinal effect for the chemical constituents of the waters. Their delightful temperature and cleansing properties, the balmy air of the valley, and the irresistable temptation to repose, incident to the place, being perhaps the really valuable agents in recovery from disease. The valley lies about eight thousand feet above sea level."

(Signed) G. S. McMurtrie.

Here we have a very modest description of this beautiful locality, abounding in attractions for the tourist, holding forth its fine medicinal springs as an invitation to the suffering invalid to come, bathe and be healed; easy of acccess; accommodations good and ample; near the metropolis of our State, with its surrounding beauty so graphically portrayed by the Doctor in his letter. Why should it not be well patronized? I would suggest a thorough trial of these waters for *hemiplegia* and *paraplegia*. It is well known that recovery from these diseases is a work of nature; yet by the proper use of mineral waters, the process may be materially aided by promoting absorption.

In speaking of the use of thermal waters for the relief of the above maladies, Niemeyer says: "We must not hope that the destroyed filaments of the brain will be restored by the use of saline waters, but experience shows that at these places, both cerebral and spinal paralysis often improve. Probably this improvement is due to the favorable influence of the baths on the inflammation about the clot, and on that portion of the paralysis due to it."

I would recommend the general use of them (internally and externally) hoping in this way to assist absorption; exercising care in all cases to not use the waters in less than five to six months after the onset of the attack, and with but little hope of relief in cases of from two to three years standing.

With time and proper application, these springs must prove a great blessing to the human family.

MORRISON SPRINGS.

These springs are located at Morrison, some twelve miles west from Denver. The Denver and South Park Railroad is completed to this point.

For the following description of the water and scenery, I am indebted to Dr. J. C. Dunham of that place, who kindly and promptly responded to my letter of inquiry. "This is a sulphur spring of rare medicinal qualities," and according to Dr. Dunham (who has had experience in the use of its waters for more than one and a half years) it acts: "1st, as a cathartic. 2d, as an alterative. 3d, as a stimulant to the secretive and excretive organs and glands. 4th, as a stimulant to the mucus membrane, having a very salutary effect upon indolent ulcers. Also acting as a diuretic in many cases." I am sorry to say there is no correct analysis of this valuable "Mineral Spring" by which to judge more particularly of its value, and class it more properly. But I am assured by the Doctor that he has found marked and prompt relief to follow its use in *dyspepsia* of the most aggravated form and long standing: also in the first stages of *Pulmonary Consumption*, particularly when complicated with indigestion. The scenery in this locality is grand beyond description. The "Garden of the Angels," (comparing favorably to that most popular resort, the "Garden of the Gods"), the "*Red Rock*" and mountain gorges, and extensive outlook from elevated points, place it at once among the most popular resorts for tourists as well as invalids.

I would highly recommend this spring to all persons visiting this country, who are suffering from any *gastric* derangement *whatever*, and would especially recommend a fair trial to all confirmed dyspeptics: situated as it is, so near the best market in the State, with fish and game in abundance, and to this added the facilities for good accomodation, which consist of a first class hotel, the "*Evergreen House*," built of white stone, beautiful in architecture, three hundred and forty feet in length, with a deck wall gracing the roof, one hundred and ten by seven feet, affording a pleasant promenade, and exposing to the eye the grand scenery of that locality. Rooms airy and well furnished, and the table well supplied with all the luxuries of the season.

With these advantages the "*Morrison Spring*" is most surely the natural home of the dyspeptic.

MIDDLE PARK.

This most beautiful park, drained by the Grand River, is situated west of the range, from Denver about ninety miles.

During the summer season the roads are good, and a tri-weekly stage carries passengers at reasonable rates to and from the park. Near the middle of this park are the famous

HOT SULPHUR SPRINGS.

I am greatly indebted to William N. Byers, Esq., the able editor of the *Rocky Mountain News*, for a description of this country, analysis of the "Hot Sulphur Springs" water, and many able and well written articles in commendation of this place, and particularly of the value of the medicinal properties of these springs, among which I find one written by our well known and able brother practitioner, Dr. A. Stedman, of Denver, from which I take the liberty of quoting.

Dr. Stedman says: "While on a 'camping tour' during the summer of 1875, I spent a portion of my time at the 'Springs,' and was so impressed with the opinion that they contained all the elements which render this class of natural mineral waters so efficacious in the cure of disease, that in addition to my own personal experience and observation, I have made many inquiries which all tend to confirm me in my opinion.

These springs have a temperature of 110° to 117° Fahrenheit, and arise perhaps from a dozen different sources, included in an area of ground (or rather ledge) about the size of an ordinary dwelling house, and flowing through distinct and well worn channels in the rock, unite in a common stream twice the size of a man's leg, which flows over a natural precipice some eight or ten feet in hight into a natural basin, covering an extent of perhaps forty to fifty square yards. This is the bath, and is covered in by a suitable building, making, with the ante-rooms, a very comfortable and convenient bath house. The water is uniform in temperature, for from the ledge of rock twice as high as the bather's head, the constant supply of steaming water comes down with a steady plunge at the rate of three hundred gallons per minute. This is one of the most important features of the bath, since it furnishes a most admirable descending douche, and after exposing the various parts of the body successively under this fall, one feels as if the whole body had been subjected to an immense shampooing and been kneaded by a giant. Sulphur is the predominating element in these waters, which is abundantly proven by the senses, both of taste and smell." The Doctor very appropriately closes his article with these remarks: "Now, without claiming for these springs any special virtues above others of their kind, and knowing very well that the tendency of the day is to convert every useful medicine or medical appliance into a panacea —a cure all—a disposition which defeats the very object it is intended to promote, and throws discredit upon really valuable springs; still, I feel assured that in well selected cases, and under judicious direction, we have in these springs an effective auxilliary to medical treatment, which will be appreciated more and more, as we become better acquainted with their qualities." The facilities for the accommodation of pleasure-seekers and invalids are as yet limited, but Mr. Bugers assures me that improvements are rapidly being made, and the accommodations will soon be ample and convenient. I have before me an analysis made from water, bottled some six months, by Professor E. J. Mallett, Jr., of the School of Mines. He makes a report of six of the springs, which he has been pleased to name: 1st, Red Sulphur; 2d, Saline; 3d, Alum; 4th, Little Sulphur; 5th, Big Sulphur; and 6th, Bath Sulphur.

The analysis is necessarily imperfect, as is shown by the time the water stood before the analysis was made, and further, from the closing remarks of the Professor himself in his report, which are as follows: "The supply of water furnished for analysis was insufficient to detect solids, present in exceeding minute quantity. The lithia was discovered by means of the spectroscope in the residue left after evaporating three hundred cubic centimeters of the water."

I will only here give one formula, taking that of spring No. 6,—or Bath Sulphur—temperature 117° Fahr.:

One pint contains grains—

Carbonate of Soda	2.8026
Sulphate of Soda	3.1386
Chloride of Sodium	1.6389
Sulphate of Potassa	.2114
Carbonate of Lime	.8033
Free Carbonic Acid	.5869
Iron	.1706
Ammonia	Trace
Total	9.3523

SCENERY.

Too much cannot be said on this subject—the entire road, from the time it strikes the mountains, is one grand view of the most sublime and magnificent scenery. Elevated to a height at times commanding an extensive view of the surrounding country, valleys, rivers and lofty peaks, all in one grand view. Again, winding along the mountain gorges, amidst the green shrubbery at your feet, with the snow-capped mountains constantly in sight, gives variety and change sufficient to keep the mind occupied and pleasant to be remembered. Arriving at the springs, few places, in summer, can combine more natural attractions than this. With Grand river, its wooded and grassy banks, surrounded by small mountains covered with pine, alternated with huge projecting rocks, while beyond and encircling all, rise the rough outlines of the "Snowy Range." The winters are said to be mild, so that persons suffering from any chronic affection need not leave the springs on that account.

The Grand river is well supplied with mountain trout, and game of all kinds are most abundant in the Park and adjacent mountains. I am fully persuaded that these thermal waters will prove to be invaluable in all rheumatic, venereal, neuralgic, and most cutaneous diseases.

Already some very important cures have been realized by the exclusive use of the water of these springs. Mr. A. Sagendorf, of Colorado Springs, having but recently returned (Sept. 12, 1876,) from "Middle Park," gives additional testimony to the value of these "Thermal Springs."

He was taken sick about the middle of April (of this year) with a peculiar skin disease, desquamative in its nature, followed by erysipelatous inflammation, in all, lasting over three months, reducing him to a mere skeleton, and in addition to this, during the later part of his sickness, extensive abcesses formed on different portions of the body, and especially the lower extremeties. As soon as he was able to be moved, he was taken to the springs, remained some five or six weeks, and is now enjoying good health. From Mr. Sagendorf I learned, that in addition to the large bath room described before, there is now another bathing house with four rooms supplied with bathing tubs, so arranged that the temperature of the water can be adapted to the most sensitive skin. He also speaks in the highest praise of the road over the range; having been constructed at a cost of near $23,000, and being among the *best* now used by mountain travel in the State.

Further, I can say that I have it from perfectly reliable parties that all who have tried these waters have been benefited, and many permanently cured. With these facts before us, we cannot hesitate to recommend all persons suffering from rheumatism in any form, all skin diseases, and especially venereal disease, to give these springs a trial, with the utmost confidence that permanent relief *must* follow the proper use of them.

MANITOU SPRINGS.

Of this popular resort there has been so much written, and it has become so widely, and so generally known, that an attempt at a general description here would be superfluous.

Situated in a most lovely place, some six miles west from Colorado Springs, on one of the best, easiest, and most accessible roads leading into the mountains—the "Ute Pass" road—these springs are the most accessible in this State. The D. & R. G. R. R. having two grand connecting roads to the east—Denver Pacific at Denver, and the Atchison, Topeka and Santa Fé, at Pueblo—passing the town of Colorado Springs twice a day with her regular passenger trains—enables all persons to reach Manitou easily and without delay.

Dr. S. E. Solly, of Colorado Springs, in a little work called "*Manitou; Colorado Mineral Waters and Climate*," published in pamphlet form, has so accurately and truthfully described the springs that, by his permission, I take pleasure in quoting as follows:

"Most of the mineral springs are to be found among the picturesque windings of Fountain creek—a clear, fast-running stream, with a rocky bed, which comes from the mountain through the " hill top." The mineral springs that are at present used are six in number. They vary in temperature from 43° to 56° Fahr., and are strongly charged with carbonic acid. Coming up the valley, the first is the *Shoshone*, bubbling up under a wooden canopy, in the middle of the main wood of the village, and often called the *Sulphur Spring*, from the yellow deposit left arround it. A few yards further on and in a ledge of rock overhanging the right bank of the Fountain, is the *Navajoe*, abounding in carbonates of soda, lime and magnesia, and still more strongly charged with carbonic acid, having a refreshing taste similar to Seltzer water. From the rocky basin, pipes conduct the water to the bath house, which is situated on the stream a little further down. Crossing by a pretty rustic bridge, we come to the *Manitou*, close to an ornamental summer house. Its taste and properties closely resembles the *Navajoe*. Recrossing the stream a little further, and walking about a quarter of a mile up the hill pass road, following the right bank of the Fountain, we find close to its bank the *Ute Soda*. This resembles the *Manitou* and *Navajoe*, but is chemically much less powerful, though much enjoyed for a refreshing draught. Retracing our steps to within about two hundred yards of the *Manitou Springs*, we cross a bridge leading over a stream which joins the fountain almost at right angles from the southwest; following up the right bank of this mountain brook, which is called "Ruxton's creek," we enter the most beautiful of the tributary valleys of Manitou; traversing the winding road among the rocks and trees for nearly half a mile, we reach a summer house close to the right bank of the creek, in which we find the *Iron Ute*, the water being highly effervescent, of the temperature of 43° 3' Fahr., and very agreeable in spite of its marked chalybeate taste.

Continuing up the left bank of the stream for a few hundred yards, we reach the last of the springs that have been analyzed, the " Little Chief;" this is less agreeable in taste, being less effervescent and more strongly impregnated with sulphate of soda than any of the other springs, and containing nearly as much iron as the " Iron Ute." Of these springs we have the most correct analysis, made by Lieut. Goe. M. Wheeler, who was in charge of the exploring expedition of the one hundredth meridian, and furnished the Colony Company by O. Loew, Esq., mineralogist and chemist of the Wheeler expedition.

THE MINERAL SPRINGS AT MANITOU.

In 100,000 parts of spring water are contained—

	Navajoe.	Manitou.	Ute Soda.	Shoshone.	Iron Ute.	Little Chief.
Carbonate of Soda, ...	134.69	52.26	23.82	88.80	59.34	15.16
Carbonate of Lithia, ...	0.24	0.21	Trace.	Trace.	Trace.	Trace.
Carbonate of Lime, ...	129.40	111.00	40.00	108.50	59.04	16.20
Carbonate of Magnesia, . . .	31.66	20.57	6.10	. . .	14.56	13.01
Carbonate of Iron, ...	. . .	Trace.	1.40	. . .	5.78	1.30
Sulphate of Potassa, ...	16.21	13.35	Trace.	5.12	7.01	6.24
Sulphate of Soda, ...	18.42	19.76	12.24	37.08	30.86	51.88
Chloride of Sodium, ...	39.78	40.95	13.93	42.12	31.59	47.97
Silica, ...	1.47	2.01	Trace.	Trace.	2.69	2.22
Total solid constituents, . .	361.60	260.00	97.49	281.62	210.87	213.48
Gasses—free carbonic acid. .						
Degree of Fahr., ...	50.2°	56°	. . .	48.5°	44.0°	43°

No springs in the State are more delightfully situated than these, or could be more attractive to the invalid. "A cool, bracing, pure air, sweeps down the valleys," and attractive excursions with varied and most beautiful scenery invite in every direction. Among the most attractive, may be mentioned the Ute Pass, Queen's Cañon, Garden of the Gods, Glen Eyrie, Cheyenne Cañon and Monument Park, all within a radius of eight miles, with good roads and splendid equipage. The hotels are ample and magnificent—equal to any in the United States—and to this, we may add the opportunity given to ascend "Pike's Peak," now made easy by the facilities used for that purpose. These springs stand at an altitude of 6,370 feet above sea level and 8,000 feet below the summit of Pike's Peak.

MEDICINAL QUALITIES.

These springs were known and held in high estimation by the Indians, long before the white men ever traversed this country, and for years after, it was their custom to make yearly visits, bringing their sick and wounded to the "Waters of the Great Spirit." A glance at the analysis will show that these waters contain a large quantity of carbonic acid gas; this imparts to them a very agreeable taste, and causes them to rest well on the stomach, "being for this reason classed with the *acidulous saline* waters." We at once see their medicinal influence in rheumatism, kidney affections, derangement of the liver, scroflula, and indolent ulcers. And in the *Iron Ute* we find medicinal properties especially adapted to nervous and uterine troubles.

I have for the past two years paid particular attention to the action of these waters in cases of asthma and consumption, and invariably in the first, and frequently in the latter, disease, permanent relief followed the proper use of them. And just here allow me to say that we cannot urge too strongly upon the invalid, or tourist, the necessity of seeking the advice of some regular resident physician before using *any* of the mineral waters of Colorado; many of the physicians would be glad to give this information and advice *free*, enabling them, in this way, to watch the effect of the water on individual cases, and thus arrive at more complete and correct information in regard to their medicinal qualities.

The *Iron Ute*, with its tonic ingredients, altitude, pure bracing air and beautiful surroundings, certainly offers an uncommon advantage to the one in impoverished constitution, and cannot be too highly recommended, and should be taken with reserve by the plethoric or robust.

SOUTH PARK SULPHUR SPRINGS.

The prominent characteristic of all sulphur water is the presence of sulphureted hydrogen in solution; hence the peculiar odor. Excepting the uniform presence of this gas, sulphur waters vary in composition. They all act as diaphoretics and alteratives.

The "South Park Sulphur Springs," five in number, are situated in South Park, near the north bank of the South Platte river, on the Fairplay road, fifty miles west from Colorado Springs by the Ute Pass road. The Denver and South Park R. R. is graded within fourteen miles of these springs, and it is confidently expected that it will soon be built to this point. The summers are delightful, being at an elevation of nearly 8,000 feet above sea level. We are also informed by those living in, and near the Park, that the winters are not severe, which seems true, from the fact that cattle remain out all winter without feeding and do well. The accommodations for invalids at the springs are limited, at present consisting of a log house 22x44 feet, two stories, with some out buildings. Mr. F. Girten, the proprietor and owner of the springs, unfortunately met with an accident some two years ago that rendered him a cripple for life, disabling him physically and financially, and interfering, for the time, with further improvement of these very valuable springs. We are sorry to be unable at this time to place before the public any quantitative analysis of these springs. During the past two years, I have had considerable experience with these mineral springs in regard to their medicinal qualities, and a good chance to test their virtue in quite a number of cases.

I have, in several cases, noted marked benefit in kidney affections, skin diseases, old ulcers, and especially in venereal troubles, and dyspepsia.

I am confident that with a small capital, so as to make the surroundings inviting and comfortable, this *must* become a popular resort and of *immense* value in the cure of the above-named diseases.

HEARTSEL'S HOT SULPHUR SPRING.

Ten miles further west from the *South Park Sulphur Springs*, we have the "Hot Sulphur Spring." This spring is two and a half miles from M. S. *Heartsel's improved* ranch, near the South Platte river. Here are found a stage station, post office, and good accommodations. Mr. Clark, the proprietor, is a gentleman in the full sense of the term, and at once makes his guests feel at home. Mr. Hearstel, the owner, is rapidly improving this place, and will soon be ready to accommodate all who may wish to try the virtue of these thermal waters. Of their contents nothing positive is known, as there has been no analysis made, to my knowledge, but, they bear a good reputation with those who have used them, and compare favorably with other thermal waters of this class. Being situated in *South Park*, and on the same road leading from Colorado Springs as the South Park Sulphur Springs, and accessible by stage every other day, it will be unnecessary here to say anything further about scenery, climate, etc.

COTTON WOOD HOT SPRINGS.

These Springs are situated in the Arkansas valley, on the Cotton Wood branch of the Arkansas river, about 90 miles west of Colorado Springs. They are accessible by stage from Fairplay; the road is good; the scenery unsurpassed; the valley beautiful, being on the west slope of the snowy range, and in a state of high cultivation. Altitude, 7,000 feet above sea level. No analysis. But little improvements. Proprietors and owners, the Wait brothers. Hunting and fishing are good, trout being in abundance in the river and its tributaries. Of the medicinal qualities but little is known. Mr. Wait informs me that, for catarrhal affections and rheumatism, he has known them to prove beneficial. Postoffice: Helena, Lake county, Colorado.

SOUTH ARKANSAS MINERAL SPRING.

These springs are better known as the "Poncho" Hot Springs; situated on "Poncho creek," in "Poncho Pass," Lake county. The San Juan, Denver, Fairplay, Colorado Springs, and Cañon City roads, all pass this place. The roads are good, and stages run regularly from Colorado Springs and Cañon City to the springs. The springs are both hot and cold. The hot springs are thirteen in number; temperature, 120° Fahr. No quantitative analysis has been made, but sulphur and soda predominate. The waters flow over a ledge of rock, forming a basin below, making a natural bath tub. The cold springs are so situated as to flow alongside of this bathing place, so that the waters may be intermingled, tempering the bath to the satisfaction of the most delicate and sensitive persons.

The valley, or "Adobe Park," lies some five miles distant, and contains over 15,000 acres, all under cultivation. All the bottom lands along the creeks and valleys are susceptible of the highest cultivation. The streams all abound with fish. Mountain trout are abundant, and can be caught within one hundred yards of the hotel. Game of all kinds is abundant, and within the reach of the tourist, as also the invalid. The springs are as yet new and untried by the invalid portion of our new State. Mr. James True, the owner and proprietor, informed me that no pains or expense will be spared in making everything in and around these valuable springs attractive and comfortable. The accommodation at present consists of a comfortable hotel, capable of accommodating some fifteen or twenty persons. Mr. True does a general mercantile business, keeping a good stock of provision and clothing, so that the wants of all travelers may be supplied. Persons living in that vicinity, who have been using these waters as a bath, say, that after using it in the morning, there is a pleasant stimulating feeling follows which is very refreshing and lasts all day. These thermal waters certainly offer inducements to invalids and others seeking rest and refreshing exercise that cannot be found elsewhere. Pure mountain air, crystal mountain streams, beautiful and varied scenery, fishing and hunting, together with the productions of a good farming country and the healing properties of the mineral waters, certainly are enough to soon rank this among our most popular resorts.

LIBERTY HOT SULPHUR SPRINGS.

These springs are situated in Rio Grande county, 31 miles due west from Del Norte, the county seat, and better known as Wagon Wheel Gap Postoffice. They are accessible by tri-weekly stage from Cañon City; the distance from the latter place is 160 miles, and the roads are good. The springs are situated near the cañon, surrounded by lofty ranges of mountains. The valley resembles a horse-shoe in form, one and a half miles long by one-half mile wide. The springs are three in number; the main one is walled up with stone, the wall being seven feet wide, eighteen long and four feet high. Over this entire enclosure the water boils up at a temperature of over 200° Fahr. From the walled basin, the water is conducted by a trough about one hundred feet in length to a bath house. This is a hewn log building, twenty feet wide by one hundred feet long, containing six bath rooms, a ladies' sitting room, and the same for gentlemen. To this building is attached a house 30x40, occupied by Mr. Wellman as a boarding house. Within four feet of the enclosed hot spring, there is a cold spring of mountain pure water, very pleasant and not the least contaminated with the sulphur spring, either by heat or taste. At "Wagon Wheel Gap," just one mile from the springs, is a good hotel, well furnished and good accommodation. In addition to the springs just described, there are others of great medicinal virtue. There has been no quantitative analysis of these mineral waters, but they have long been known for their specific effect in rheumatism, scrofula, skin diseases, and more particularly, venereal troubles. One spring contains an active cathartic, producing free evacuations from the bowels in a few hours after taking it. For the past four years the number of invalids visiting these mineral springs has gradually increased, and at the present season about fifty are in daily attendance.

The scenery is grand beyond description. The streams are abundantly supplied with fish, and the mountains with game of all kinds. The valleys afford plenty of grass, and consequently large herds of cattle are to be seen at all times feeding near the banks of this beautiful stream, the Rio Grande river. Del Norte, thirty-one miles east, is a place of some 3,000 or 4,000 inhabitants, and well stocked with all kinds of merchandise. The Denver and Rio Grande R. R. is now completed within ninety miles of Del Norte, with a prospect of being extended to this point during the next season. The reputation already gained, by the many permanent cures of obstinate diseases by these waters, is rapidly extending, and will soon rank them among our first watering places of the West.

CAÑON CITY MINERAL SPRINGS.

Cañon City is a prosperous little village, situated at the mouth of the Grand Cañon of the Arkansas river, in Fremont county, and is the terminus of the west branch of the D. & R. G. R. R.

Pleasantly located, with mountains rising on all sides of it, and being much lower than Denver or Colorado Springs, the winters are much milder.

The mineral waters are both hot and cold, iron and soda. On a card sent me by J. W. Dawson, M. D., the Superintendent of the springs, he states that a new, and thoroughly fitted *bathing establishment,* is now completed and ready, for the accommodation of invalids and others who desire to use the waters of the celebrated Hot Springs at Cañon City.

Prof. Leow, of the Wheeler expedition, has analyzed the waters from these springs, and in his report says: "Of all the mineral waters of the west which I have analyzed, I find those of Cañon City the best. In mineral constituents and the temperature of the water, they are very similar to *Vichy*, by far the first alkaline bath in Europe, and the greatest thermal establishment in France." The temperature of the water in the spring is 98° to 102° Fahr. This spring, as also the other—soda and iron—spring, are directly accessible by the D. & R. G. R. R., now completed to Cañon City. First-class hotel accommodation and two livery stables with a good supply of horses for riding and driving.

The analysis as given by Prof. Leow, and published by Dr Dawson, just referred to, is as follows:

SALTS.	Cold Springs.		Hot Spring.
	Iron Duke.	Little Ute.	Hot Spring.
Chloride of Sodium,	83.0	118.0	18.2
Sulphate of Soda,	12.2	12.1	79.3
Carbonate of Soda,	76.8	76.4	73.2
Carbonate of Lime,	33.0	22.5	33.5
Carbonate of Magnesia,	14.6	14.0	12.8
Iron,	Trace.	Trace.	....
Lithia,	Trace.	Trace.	Trace.
Total grains of Salt in one gallon.	219.6	243.9	217.0

The above analysis suggests the great importance of the use of these waters by debilitated and wornout constitutions, resembling, as they do, in mineral constituents, temperature, and curative effect, the celebrated *Vichy* water of Europe. I have been gratified at the results of sending my debilitated patients to this place during the winter months; being much lower and so well protected from the winds and storms by the surrounding mountains, the patient passes the winter here without experiencing the severe changes of climate other portions of our country are subject to during the months of March and April. The scenery around Cañon City is beyond description. No pen has ever done justice to the grandeur of this part of *our State. The Grand Cañon* of the Arkansas rivals the *world* in grandeur.

No person can visit this grand piece of Nature's mechanism without becoming impressed with an inspiration that acknowledges the existence of a Divine Architect.

Grape Creek, emptying into the Arkansas river just at the mouth of the Grand Cañon, furnishes a variegated picturesque cañon that is far superior to many more noted and better published places of resort for the pleasure seeker and naturalist. Near this place we find the famous Cañon City Coal Mines; having the thickest vein of coal, and being most extensive mines of the kind, now known in the State. Thirty miles south and east lies the "Wet Mountain Valley," a large scope of country, well watered and in a high state of cultivation, producing wheat and all kinds of small grain sufficient to supply the entire southern part of the State. Only a short distance north and west from the townsite, there is an *Oil* well, or spring, which, in its natural condition, furnishes oil sufficient to supply the market for Fremont county. Truly, the *natural* resources of Cañon City and vicinity are extraordinary, and if properly utilized will be sufficient to make it a city of no mean proportions.

There are many other springs in Colorado of which I could obtain but little information. The springs at Ouray City are highly spoken of, and held in the highest estimation by the Indians and old settlers of that part of San Juan county. So, perhaps with many others—entirely unknown at present—of valuable importance, waiting only for future investigation to make known their claims upon the medical fraternity, to place them before the invalid portion of society, and to secure them notoriety on account of the healing qualities they possess.

REPORT

ON

The Climate of Colorado in relation to Asthma.

By H. A. Lemen, M. D.

Member of the Board.

THE INFLUENCE OF THE CLIMATE OF COLORADO ON ASTHMA.

That the climate of Colorado exerts a beneficial influence in nearly all, and a curative influence in the greater percentage of cases, of Asthma, is now a well attested fact.

Relief from this very distressing malady frequently occurs as its possessor crosses the plains, *en route* to Denver, or some other point in the State. In other instances, the amelioration is not so sudden, and may not occur until after a residence of some weeks or months within the State.

A few find the air of the mountains requisite—experience no improvement until the "foot hills," or even the more elevated regions of the higher mountains, are attained.

I think it may be stated as a fact that the number composing the latter class is comparatively small.

The majority of asthmatics for whom there is benefit in the climatic conditions furnished by our State, will not find it necessary to appeal to the mountain regions for relief; though many who experience benefit or cure while residing within the limits of the State east of the base of the mountains, experience no inconvenience, aside from the slight shortness of breath induced by respiring air of diminished density, on visiting the mountain resorts.

To this law there are few exceptions. Strange, indeed, would seem that law relating to asthma and yet furnishing no exceptions. In fact, as is well known by the medical profession at least, the capriciousness of the ailment under consideration, in reference to the cause of the affection in different individuals, as well as the treatment best calculated to relieve, is proverbial. Individuals in the valley may suffer from it, and be more or less exempt on the hills, and *vice versa:* the denizen of the large city may contract it, and get relief in the country air, while his country cousin who has contracted it in the locality where the former finds more or less relief, may realize amelioration by repairing to the large city.

As Sir Thomas Watson has suggested, the eccentricities of asthma may extend still farther. An individual has been known to have the affection while residing on one side of the street, and escape it upon changing his residence to the opposite side.

In not a few instances its *cause* is supposed to be of hæmic origin—some subtle and ill-understood blood perversion, acting upon the nerves supplying the muscular element in the walls of the bronchial tubes.

In other instances it appears to be due to an excessive irritability of the same nervous trunks and filaments, whereby their polarity is disturbed unduly by influences ordinarily not obnoxious to them, and in such manner as to occasion spasm of the bronchial muscular fiber, constituting a true neurosis. In still other instances, the cause appears to radiate from the stomach in perversion of digestion of some form or other.

In a few instances organic disease of the heart, or of the great intrathoracic blood vessels, appears to stand in a causative relation. It may alternate with affections of the skin, or present upon the disappearance of accustomed discharges, etc.

Thus is its perversity and capriciousness manifest from whatever standpoint it may be viewed.

With all this, if I were called upon by an asthmatic to formulate that law in reference to asthma, which I consider the most universal in its application, I should do so in the following language: Residence in the State of Colorado is the most certain cure for the average asthmatic that has yet been devised.

As corroborating the truthfulness of the above statement, I appeal to the experience of the medical profession of Colorado, and also present an analysis of 117 cases of asthma, reported at a meeting of asthmatics, convened in this city on the 18th of December, 1873, and to which the reader is referred for detailed information respecting each case reported. (See "Colorado and Asthma," Colorado: Rocky Mountain News Steam Printing House, 1874.)

An analysis of the 117 cases reported at the above convention, with reference to several points of interest, I shall now present for what it is worth.

ANALYSIS.

Of the 117 cases, it appears that 95 were males, and 22 were females.

The following table will exhibit the number from each State, as well as the State contributing to make up the total:

TABLE NO. I.

Wisconsin	8	Iowa	6
Minnesota	7	Kentucky	6
New York	9	Connecticut	2
Kansas	4	Missouri	10
Indiana	6	Rhode Island	1
Michigan	12	Alabama	2
Ohio	3	New Hampshire	2
Illinois	25	California	1
Pennsylvania	5	Texas	1
Nebraska	3	Unknown	1
Maine	3		
Total			117

The ensuing table exhibits the localities in this State at which the subjects resided at the time of the convention, as well as the number in each locality:

TABLE NO. 2.

Denver	83	Colorado Springs	3
Fort Collins	4	Golden	2
Greeley	1	Trinidad	1
Foot Hills	2	Bear Creek	1
Erie	2	Green City	3
Littleton	3	Georgetown	2
Pueblo	2	Boulder	2
Longmont	1	"The States"	5
Total			117

It will be seen from the above showing that almost every leading locality in the State furnished climatic conditions favorable to the well being of the asthmatics represented in the convention.

AVERAGE DURATION OF RESIDENCE.

The average duration of residence in the State will be conceded to have been ample to test the benefits of the climate, when the statement is made that it was no less than 26 months and 13 days for each individual reporting, with the exception of four, who failed to state, directly or indirectly, the length of time they had been in the State.

The remaining 113 had averaged a residence of 26 months and 13 days, as above stated.

The 117 have been divided in the following table into four classes, for the purpose of conveniently exhibiting the results of residence in this climate:

TABLE NO. 3.

Relief only in the higher altitudes	4	Decidedly relieved	33
Partially relieved	8	Cured	72
Total			117

From the above, it appears that 3.41 of the whole number had to repair to the "higher altitudes" to obtain relief from their malady, while but 6.82 per cent. declared themselves "partially relieved," and 28.06 per cent. "decidedly relieved."

But the encouraging feature—at least to the asthmatic—of this report is, that no less than 64.10 per cent. declared themselves *cured.*

I think it may be safely asserted that such flattering results have not been hitherto attained by any plan suggested for the relief of the asthmatic, and the citizen of Colorado, points to the charming climate of this land of wonders, as almost a specific for that most harrassing disease now under consideration.

The philosophical enquirer after truth would naturally enough raise the question: Were all the cases reported at the above convention, instances of unquestioned asthma? The answer is: With very few exceptions, they undoubtedly were. Dr. R. W. Whitehead of this city, reviews in the April number (1874,) of the American Journal of the Medical Sciences, a number of cases reported by the convention, and contributes some quite pertinent remarks upon the probability of their all having been asthmatics. He states: "It is to be regretted, though, that the record of the above-mentioned cases did not receive a careful medical supervison. * * *

Although it is quite probable that some of them are cases of dyspnœa, dependent on causes quite unconnected with asthma, yet most of them clearly convey the idea of a spasmodic attack of difficult breathing, recurring in such a manner and under such circumstances as to unmistakably denote the disease known as asthma."

The Doctor alludes also to the fact that a few of the cases mentioned in the "Report" were patients under his care at different times for other ailments than asthma, and that through the "courtesy of Mr. F. J. B. Crane, an active member of the committee on the publication of the report," he had "been permitted to make a physical examination of a considerable number of the cases reported."

Other physicians in this city have had the same privilege accorded them, and the public abroad, and especially that portion of it suffering from asthma, may rest assured that the "report" was made in good faith, and that the convention was composed, as represented, of cured and greatly relieved asthmatics who, in many instances, before coming to Colorado, had suffered years of indescribable torment from their malady

Corroborative of the entire gist of this short, and as I am aware, incomplete article, it affords pleasure to append the preambles and resolution, passed by the Denver Medical Association, and which are appended to the "Report" which has furnished a basis for the statements herein presented.

DENVER, COLORADO, December 8, 1873.

"WHEREAS, A number of citizens of Colorado, who have suffered, or are still suffering, from Asthma, are now preparing for publication, a pamphlet containing in detail, a history of their individual cases, showing that the vast majority of such cases, if indeed not all, are cured or benefited by the climate of Colorado, and

WHEREAS, Said Asthmatics have called upon the Medical Association of Denver to express their views on this subject, it is therefore

Resolved, That in the opinion of the above Medical Association, the climate of Colorado in and about the range of the Rocky Mountains, has a wonderfully curative power over Asthma; that nearly all such patients coming into this climate, are relieved—at least so long as they remain here; and that all, if not entirely relieved, are sooner or later benefited with the exception of those cases dependent on, or complicated with, organic disease of the heart or lungs.

HENRY K. STEELE, M. D., *President*,

H. J. PRATT, M. D., *Secretary*."

The phraseology of the latter part of the above resolution, is, to put it in the mildest form, very unfortunate. Dr. Whitehead, previously quoted, aptly states that: "These restrictions would exclude many asthmatics who have been signally benefited or cured by a residence in Colorado, and it requires neither a long residence nor an extended observation to be aware of this."

It is an undeniable fact that many cases of asthma of long duration, are complicated with either vesicular or atrophic emphysema; not a few have tubercular deposits in the lungs—the case may have passed from the category of phthisis to that of asthma; and in cases of long standing, it is no uncommon occurrence to find the right cavities of the heart and the great biood-vessels leading therefrom, more or less dilated from too frequent over-distention.

In fact, one of the most remarkable instances of relief from asthmatic suffering that I have witnessed since coming to Colorado, occurred in the case of a lady aged thirty-three, who had been bed-ridden more or less for six years before coming here, and who had ineffectually sought relief in Minnesota and Texas, and in whom, as careful physical exanination revealed, there were evidences of a dilated condition of the right cavities of the heart, of the great blood-vessels connecting therewith, especially the venæ cavæ, and a tubercular deposit of ancient origin in the summit of the right lung.

While it is a fact then, that asthmatics suffering from *organic disease of the lungs* may, and do, come to our climate with benefit, and even in some instances when there is at least that form of "organic disease of the heart" known as dilation of its right cavities not dependent on disease of the mitral valves, still, I would not wish to be understood as inculcating the doctrine that those cases complicated with marked valvular lesion, and especially when of a character to permit regurgitation, should repair here for relief.

REPORT

ON

Schools: their Relation to Health, Etc.

By Aaron Gove,

Superintendent of Public Schools of Denver.

SCHOOLS: THEIR RELATION TO HEALTH, ETC.

To the Secretary of the State Board of Health:

In reply to your invitation of April 14th, to report to your body on "Education—the relation of schools to health, the kinds and methods of instruction, and the capability for mental exertion in this State," I have the honor to submit the following:

In no part of our present civilization is the care and advice of the intelligent and observing physician more demanded than in the public schools—no two professions are so clearly allied in works and in results as are those of physician and teacher; the latter is indeed powerless without, at least, a *modicum* of that elementary knowledge which pertains to the art of medicine. Many who preside in our school-rooms have this little, and it is the veriest little, while many more are quite ignorant; this is the fact, however much we may deplore its existence. It is not to be presumed that any comprehensive knowledge of hygiene and physic can reside in the teacher—his own specialty affords a field for a life-time of investigation and effort. From where then can light and assistance be received, save from the doctor of medicine? It appears that every School Board should have as one of its members a physician. With the exception of remote country districts, this is possible. The school law provides, in small districts, for a board of three, in large towns for a board of six members. In every village and city, one of these three or six, should be a member of the medical fraternity. Instances of mistake and wrong, patent to the doctor, during his frequent visits as a school officer, promptly catch his eye, and the suggestion is followed by the remedy, and the latter at once applied; and this where the teacher, often by reason of daily contact, has failed to notice any evil. A pupil is affected by a disease doubtfully contagious. Who is competent to decide but the physician? One is withdrawn from school because a neighboring family is sending from a house in which rumor says is scarlet fever; no certificate to the contrary is of avail but the doctor's. A boy has sore eyes. Can the disease be communicated to other pupils? The doctor must answer. The instances of the necessity of the continual counsel and advice of the physician are of weekly occurrence in every school.

It may be a question how far mental effort, as induced in the average school, interferes with general health. It does not appear that hard study—intense application—is harmful. The essays that are published, the sad *cases that are cited* of the ruin of school children by study, often omit part of the story; for other causes than mental assiduity generally appear in the background. Among such causes may be mentioned bad habits of study and ruinous practices out of school hours. Poring over books eight hours a day makes ill students when five hours real study a day would be healthful. Failures in health come not so much from over-study as from lack of study—insipid, lazy, dawdling, shiftless conning of tasks. The fault in such cases is with the teacher in failing to teach the pupil to learn how to learn.

A recent investigation of the condition of high-school girls in a Massachusetts town, gave figures, showing that of those who were suffering in health, eighty-five per cent. were addicted to late hours and injurious habits of eating, sleeping and exercise. It is easy and human to say to a fond parent "Your daughter is very brilliant; it is a pity to have her ruined by study; take her out of school for a rest; she will recuperate; she is over-tasked." The parent *does* take her out of school, for she *is* over-tasked, but alas, the overburdening has little relation to mental effort in study. That pupils, especially girls in their teens—high-school girls—and nervously organized boys, are sometimes wrongly treated in our schools, is true. Emulation, appealed to, is dangerous with such; it is possible to over-work these, but probably little danger exists in insisting upon the minute performance of all reasonable tasks.

Three and four-storied buildings for schools have had a full share of condemnation during the past decade, so much, that an intelligent board, at the present time, will scarcely erect a house where pupils must ascend two long flights of stairs several times each day. Where such buildings already exist, the alternatives are, water closets constructed on the upper floor, or, the older pupils placed on the lower floor, leaving the stairs to be climbed by children from six to twelve years old.

Much attention has been called to the duration of school-hours. The discussion originated where all such true reforms have, with physicians. A part of the people believe in long school days, while a respectable minority insist that the good old way—from 7 o'clock a. m. to 6 p. m., is better. The latter produce an argument to them unanswerable: "Can a man saw more wood in six than he can in ten hours? Then my boy can't learn as much in six as he can in ten hours." It is useless, ineed, to attempt to convince these logicians. Our only hope must lie in their children. In view of the above sentiments, the following has been adjudged as the best that can be arranged now, for it must be remembered that the schools are the people's, and that reforms are necessarily of slow growth. Children six years old, the youngest that our law permits in school, are detained three hours a day; seven years old, four and a half hours; eight and nine years old, five hours; all others, five and a half hours. I am ready to testify, that with the above time schedule, better scholarship is produced than when, ten years ago, we detained all, great and small, in the school-room six hours. Statistics and printed observations and experiences on this point are abundant, in the pedagogical literature of the country, hence arguments here would be but compilations. When possible, these school hours should be equally divided into two daily sessions.

You have asked for something of the peculiarities of our climate as *affecting the schools. I regret* that little more than theory or opinion can be expressed, for your body must have facts and statistics in order that your paper may have value. Since receiving your invitation five months ago, a three months' vacation has occurred in most schools, and little opportunity for observation and experiment has been; and, too, from ignorance, I am unable to institute experiments and make definite observations, except under the guidance of a scientific body like your own. I wish to suggest that a committee from your own profession, prepare and submit a series of queries to be answered by the school principals of the State. I would have these questions ask for facts and figures, to be obtained during the year and returned to you. In such a way can we begin to lay a foundation upon which to base subsequent investigation. The opportunity is a rare one. I doubt if any field can present a richer harvest for original work. The situations and altitudes of our schools are very unlike any others in a single State or country, while each differs materially from the other. The teachers of the State will, I am sure, gladly co-operate in a matter so nearly related to their work; and the State Teachers' Association and the State Superintendent offer mediums through which you may work. The following, from the last report of the Board of Education of Denver, is in our line of thought:

The problem of the effect of our climate and altitude upon mental activity is placed often before us, and upon its solution must depend the line and amount of work prepared for school children to accomplish. Only time can be competent to furnish this information. The opinion is general, nearly unanimous, that with the exhilaration and *stimulus* communicated to individuals at their advent to our city, a corresponding impulse is communicated to the mental powers; but whether this enhanced mental power is permanent, or whether, to natives of our climate, increased mental vigor accrues, is yet undecided. After a somewhat careful observation and comparison, I incline to the belief that our boys and girls can do more school work in a given time than can the children of the lowlands; that they are as quick in the perceptive, and more intense in the reflective powers. If our pupils have more application, more intensity, it reasonably follows that the effort must not be prolonged. Little more than theory, however, can at present be stated. I hope by experiments and observation to be able, in time, to give definite information on this important part of the work; the great difficulty lies in the impossibility of estimating the amount of mental force exerted; the power is imponderable. Believing that our primary calculations should be based on physical development, I asked during the year from several cities, the average expansive power of the chest. The examination was carefully conducted by physicians upon native boys twelve years old. The results show an increase in proportion to the altitude. The figures are as follows:

Brooklyn, New York, (sea level) one and one-half inches.
Indianapolis, Indiana, 800 feet, two and one-half inches.
Bloomington, Illinois, 800 feet, two and one-quarter inches.
Denver, 5,300 feet, three inches.
Central, Colorado, 8,300 feet, three and one-half inches.
Boston, Massachusetts, two and one-half inches.
Aurora, Illinois, two and three-fourths inches.

With the exception of the two last, these cities are near our parallel. It is possible that the higher latitude may account for the increase. This entire experiment, at best, is quite unsatisfactory, and yet it may help to make one little element in our investigations.

Headaches, so common in eastern schools, are certainly less frequent in Colorado. This may be attributed to better ventilation here, or really the absence of ventilation, for our school rooms, during the greater part of the year, are so thrown open, that the air is uniform inside and outside. During the last school year, not to exceed thirty days passed, when each room was uncomfortable, with the sashes raised. Notwithstanding the meagerness of of this paper, I am satisfied that the great beyond, in this line of thought, is a prize well worth striving for, and hope the matter may be placed in able professional hands for future effort.

REPORT

ON

Food, Drinks, and Water Supply.

BY A. Y. SMALL, M. D.,

Member of the Board.

FOOD, DRINKS, AND WATER SUPPLY.

The food necessary for man depends upon the climate in which he lives. In the tropics, a diet composed largely of vegetables and fruits is indicated, and in the frigid zones, a diet composed almost exclusively of animal food is indicated. It is in the temperate climates that the diet of man should be composed of both vegetable and animal food; or at least, the habits and necessities of inhabitants of temperate climates would indicate that a mixed diet is preferable. Food which is necessary and beneficial to one man, may be injurious to another, much depending in this respect upon the state of the system, or upon the age of the person. It cannot be denied, however, that a mixed diet is, as a rule, the one best suited to the wants of man.

Man, as an omniverous animal, should not be confined to one kind of diet, since its long continuance will lead to degenerated health, on account of the lack of albuminous substances in one class, or fatty substances in another.

Food should contain all the elements of nutrition, and at the same time be digestible and assimilable, since in its assimilable quality lies its greatest, and in fact its only use to man; for in its dissolved state it is absorbed and in due course becomes blood, (which is the life,) from which the waste upon the tissues of the body are replenished, and built up; it is as fuel to the consuming fire, supplying the place of that which has been consumed in the use. The different states of the body may indicate a different diet, at various times in the same individual; and food which may be highly nutritious in quality may be also highly indigestible, and consequently greatly injurious; while if its digestible quality were good, would be highly beneficial, because of its highly nutritive quality.

One man may eat what another may not eat, and *vice versa;* and yet both be in equally good health. Habit is a powerful factor in determining what may or may not be taken as food, as will be perceived by persons traveling in Europe, or in our own country, as to that matter. For instance, an American, or Englishman in Continental Europe, may be attacked with diarrhœa from partaking of a diet to which he is unaccustomed, but which experience proves is equally wholesome when he has become accustomed to it. This is also proven by reference to the fact, that soldiers, on enlisting in the army, are often attacked with diarrhœa, from which they suffer until they become accustomed to their new and changed mode of diet. An ill fed person, or one accustomed to live on the plainest and coarsest diet, will be very apt to suffer inconvenience on a change to a rich and savory diet. The circumstances of the system have a great influence on the disgestibility of food. A diet well adapted to Lapland, or Nova Zembla, would produce disaster, disease and death, in the Isthmus of Panama, or in the tropics.

The season of year, exposure, the amount of clothing, the exercise to which a person is accustomed, are all to be considered as exponents, in determining what should or should not be eaten. The calling or profession of an individual, is also important in determining what he may, or may not, eat; what he ought, and ought not, to eat, for the well known reason that certain kinds of food act more directly upon the brain, and produce mental activity and vigor.

It would be impracticable in an article like this, to go into an elaborate discussion of the art of domestic economy as related to cooking, and the different kinds of food with their method of preparation, as taught in works upon this subject; but it will not be amiss to say that the methods of preparation, in many cases, are highly injurious and detrimental to health: as also, that the food itself is not that best adapted to the wants of the system, in many instances.

The food necessary for dyspeptic persons, and those of feeble digestive powers, is a topic of great importance, but one to which only a passing notice can be given.

One dyspeptic will digest and assimilate an article of food which would be detrimental to another, and *vice versa*; and hence, it is of the greatest importance to the dyspeptic to be careful to avoid those articles of food which are injurious, and to seek only those which are found to agree well with the stomach. The advice of the Physician, and the experience of the patient, in cases of this kind, are necessary, in order to determine just what may be eaten.

The food of infants and persons of tender age, should be different in many respects from that of adult persons, for the reason, that the food of the infant serves a double purpose—that of building up the system, and also of repairing the waste of the body. For this reason, infants should be fed on a highly nutritious and easily digested diet. Milk, fat, and lean meats, should, as a rule, always compose a part of their diet. Pastries, unripe fruits, highly salted meats, and acid drinks, should generally be avoided: they should be permitted to eat oftener than adults, and restrained from over eating.

Regularity in eating, is a point to be observed by all, for upon habit much depends; and besides, the experience of mankind, as well as the convenience of society, dictates the importance of regular periods for the meals of the day. Three meals a day, at intervals of five to six hours, are all that are requisite or necessary for a person in good health, while infants, and invalids may, and should be made an exception.

The body of a human being is in a state of constant change. Change is a law of our being. It is written in idelible lines in the life and experience of us all; every pulsation of the heart speaks of change; every thought is the result of change; every movement of the body speaks a language of change, and is attended with the disintegration of a certain portion of the tissues of the body which, by these changes becomes useless, and is *eliminated from the body.*

Again, the temperature of the body is higher than that of the air in which it lives, and the maintenance of a fixed or certain temperature is an essential of health. The constant waste of tissues and the necessity of maintaining a fixed temperature, demand supplies of food by which waste can be repaired, and the temperature maintained. According as food serves one or the other of these requirements, it is termed plastic or histo-genetic (tissue forming) or calorifacient (heat-producing); this last, too, from its uniting in course of the circulation with the oxygen absorbed during respiration, has been termed respiratory food. These terms are to be regarded as relative to the truth; for the tissues themselves, in the process of disintegration, also unite with oxygen and are calorifacient, while fat, one of the principal of the respiratory forms of food, enters largely into the composition of the nervous system, and its presence is essential to the process of cell growth, by which the tissues themselves are formed.

The better division of the varieties of food is a modification of that produced by Dr. Prout, by which they are formed into four groups, the *saccharine*, the *oleaginous*, the *albuminous*, and the *gelatinous*. To the first, or saccharine, belongs that class which abounds in starch, sugar, gum, and their allied substances. These are themselves composed of carbon, hydrogen, and oxygen. By themselves, they are not sufficient to supply all the requisites of a complete nutrition, and death would result from their exclusive use. They are, however, useful, and chiefly so, for maintaining the animal heat; the oxygen and hydrogen existing in the proportions which form water, and their heat producing value being represented by the carbon contained in them. To the second, or oleaginous group, belong the fats and oils, whether of animal or vegetable origin. Like the saccharine group, these, of themselves, will not sustain life. And like the saccharine group, one of the principal uses of the oleaginous group, is the production of animal heat; and for this office their chemical constitution adapts them in a peculiar manner. They consist of carbon, hydrogen, and oxygen alone; but the latter two do not exist in the same proportion as in water, the hydrogen being in excess, and by so much, its heat producing quality is enhanced. One part of fat, says Liebig, is equivalent to two and a half parts of starch for calorifacient purposes. It it this quality which makes oils so valuable as an article of diet in the high latitudes of the North. The albuminous group contains carbon, hydrogen and nitrogen, and in addition to these it contains oxygen, together with minute proportions of sulphur and phosphorus.

It is therefore the group, by preëminence, forming the histo-genetic or plastic material of food. In the muscular and glandular structures of man, the greatest per cent. of waste takes place; and hence, as they consist mainly of albumen and fibrine, no aliment which does not contain either of these substances, or some modification of them, is sufficient for the reproduction and repair of the waste to these parts. Like albumen, gelatine is one of the constituents of all the higher animals; and like it, too, it contains nitrogen. It forms the principal part of the skin, of the tendons, ligaments, and cartilages of the animal kingdom.

From these groups of food, and from a knowledge of the constituent parts of them, and of the wants of the system, in whatever climate it may be *the lot of man to live*, and from a knowledge of the properties of the different articles of food, we are to determine the question: What shall we eat, and by what shall the waste of the body be repaired?

It will appear from these observations, that the art of cooking, and the selection of articles for the cook, are questions of vastly more importance than might at first thought appear. These interesting reflections might be extended to greater length, and an analysis of different articles of food be entered upon, with reflections upon digestion and assimilation; but the purpose of this paper is to suggest a line of investigation and thought, not new in itself, but of a character indicative of something more useful. What to eat, is in fact a branch of science, as the preparation of food is itself an art. We quote Martindale, and then enter upon the consideration of "Drinks and Water Supply." He says: "All kinds of fresh meat are better during the cold weather, and some kinds are unfit for use at any other season. Fresh pork should not be eaten in warm weather; and oysters and clams are a fruitful source of disease during the summer months. The flesh of fish is very similar to the meat of animals, although it is not so easily digested. Fish undergo decomposition rapidly, and, when tainted, are very injurious, and even poisonous to the system. They are never improved by keeping, and should be eaten as soon after being caught as possible. Winter and spring are the best seasons for fish, as the cold water seems to improve their flesh. *Milk* is very nutritious, is easily digested, and is well adapted as nourishment for the sick and the convalescent."

"Eggs are about one-third pure albumen and fat, and are most wholesome when soft-boiled. When fried in the fat of ham, they are very indigestible, and seldom agree with persons having dyspepsia."

"The best modes of cooking meats are by roasting and broiling; and the poorest modes are by boiling and frying. In roasting and in broiling meats the juices are preserved, and the meats are rendered more digestible than by any other way of cooking. In boiling meat a portion of the nutrient juices pass into the water and is wasted. Frying is the worst way of cooking, as the heated fat penetrates the meat, rendering it dry and hard, and making it very indigestible. (We affirm:—the frying-pan is a constant source of disease, and is a useless piece of kitchen furniture. Fully two-thirds of all dyspepsia is occasioned by a two free use of the frying-pan.) Ham, sausages, and other forms of pork, should never be eaten without cooking. The flesh of the hog often contains a slender worm, called "trichina spiralis," which, when taken alive into the human stomach, multiplies rapidly, and gives rise to a very painful and often fatal disease. When the pork is thoroughly cooked, this worm is destroyed, and the meat may then be eaten with impunity."

DRINKS, ETC.

The body, containing as it does, a vast amount of fluids, which are undergoing a perpetual waste, there is therefore a necessity for an occasional supply of fluid of some kind, as well as of solid food. In the economies of nature, the wastes must be supplied, and it remains to be considered what is thus required, and what should be the character or nature of the supply, *in order that it may serve the end consistently with the preservation of health.*

Man, in all ages, and in almost every clime, has been in the habit of drinking large quantities of liquors containing alcohol: and this custom is one so prevalent in our time, as to be the occasion of common remark. To make any objection of a decided character against this inveterate habit, may be classed as a species of fanaticism, by some; yet, the investigator of those laws which regulate health, is bound to consider, above all things, how any particular habit bears upon the constitution, and to state the result of his inquiries, however irreconcilable it may be with popular prejudice. We do not hesitate to give as our opinion, that: *Alcoholic drinks should never be used, unless prescribed by a physician.* The evil effects of alcohol upon the system, are well understood by all. We may only add, with emphasis: *all alcoholic drinks are unfavorable to health, and their constant use, is highly injurious.*

The health of any community, or of an individual, depends largely upon the purity of the water used for domestic purposes. The effects of fungi, conveyed into the blood, through drinking water, are sometimes of the most startling and distressing nature. Thus was caused the foot disease of India, and the Damascus sore. Wells that are blessings in a country village, become curses, when the place increases to a town or city, unless very properly drained. There are numerous instances where typhoid fever, as well as other diseases, have been caused by drinking water from certain wells, or from an aqueduct. As an instance: In 1865, at Saluthem, every house supplied from a certain aqueduct, had one or more of its inmates suffer from typhoid fever. The epidemic at Lausir, in 1872, is a still more remarkable instance. In Stuttgart, in the same year, the epidemic was very fatal, and was caused by the meadow from which the aqueduct receives its supply, having been manured the previous fall, with sewage obtained from the city sewer. Similar cases are reported from Hale, in Basle, in Zurich, and in London. The cholera epidemic in London, in 1853 and 1854, showed very distinctly, that in those parts of the city, where the filtered water taken above the influence of the sewage of the city, was used, the epidemic was very much less malignant, than where the impure water was used. It is difficult to estimate the effect of impure water; it cannot be known, so slow and insidious are its effects; and especially is such the case when no epidemic is present to bring it into daylight.

Praise pure water as we will, there is no doubt that *impure* water, in its time, has done more damage to human health and life than all other beverages combined. Few subjects are of so much, or of so vital importance, as that of having pure water for the daily use of families, for upon it depends the health of the people, in a very large degree.

To sum up: an adequate supply of good, wholesome food, and plenty of good, pure water, and we have, other things being equal, the foundation laid for health in the family, happiness in the nation, and thrift among the people.

Pulmonary Consumption.

Report to the State Board of Health on Forty-four Cases;
Results of Physical Examinations of the same, together
with Running Comments on Cases illustrating types
of the Disease; the results of Altitude, Climatic
Influence, and Medicinal Treatment.

BY H. A. LEMEN, M. D.,

Secretary of the Board.

PULMONARY CONSUMPTION.

Mr. President and Gentlemen:

More than once have I had reason to regret the choice which assigned to me the subject which forms the caption of this report.

Last year, as some of you may remember, I had something to say before the State Medical Society, relative to "The Early Symptoms and Signs of Phthisis Pulmonalis"—a voluntary contribution.

I did not then feel prepared, nor do I now, to treat exhaustively upon the relations of our topographical conditions, and the climate dependent thereon, to this interesting and complex malady; although doubtless not a few within the bounds of this state, and many abroad, expect one who consents, or voluntary proposes, to treat of the subject under consideration, to handle it from a Colorado standpoint.

Much of our "capital in trade," ever since the settlement of this country, has been its reputation for salubrity.

Column after column has been written in home papers, justifying the consumptive in the belief that the millennium had arrived for *him*, at least.

Railroad circulars, hotel advertisements, real estate agents' tracts, eulogized the beauties of our mountain scenery, the purity of the air and water, the brilliancy of our sunshine, the dryness of the atmosphere, the unsurpassed excellency of our beef, mutton, and dairy products, until many a consumptive was lured from friends and home in the distant east, frigid north, or sunny south, hopeful "till the last day in the morning," to come to our enchanted land at any sacrifice of strength, home comforts, finances, with no richer reward in the end than to obtain a mere glimpse of the snow-capped mountain tops, quaff for a few hours, days, or weeks, our exhilarating atmosphere, realize the not uncommon toughness of our beefsteak and sagebrush mutton-chop, to return to the scenes of a deserted home in the habiliments of the grave. Others, suffering from the same dread malady, have fared better. Their lives have fallen to them in more pleasant places. Their *exchequer* has warranted an indulgence in porterhouse beefsteak, mountain trout, cream, etc., to the extent of the capability of their digestive power, and their sojourn has been with friends well calculated to entertain. They have benefited in some respect, and their lives, if not materially prolonged, have been rendered more tolerable. They have not been so completely drenched in night sweat, or kept within doors by inclement weather, or tortured by hot, sultry, suffocating nights; scene and surrounding have changed; a flood of sunlight warms and cheers them; mountain grandeur inspires them; cool, dry nights give refreshing slumber, and if, having buoyed up for a while under such magic influences, they succomb somewhat unexpectedly to themselves, their friends, or even their medical advisers, they have done, perhaps, on the whole, just that which was best for them to do.

Others, again, not so hopelessly given over to the malady, but with indubitable tracings of shattered health and well marked indications of local lesion, quit unfavorable hygienic surroundings at home, desert the counting room, the desk, the dust-laden air of the manufactory, and, divorced from their labor, and released from the friction of the old grooves in which they have been running, come to us, and inspired by the temptations growing out of the peculiarities of our climate and scenery to outdoor life, indulge in that most potent means of renewing the wasted energies of the body and mind, moult their tissues anew, and really extend their lease on life.

And others still, warned by the loss of father, mother, brother or sister, of consumption, with mutterings of ill health, yet not possessing that vulnerability of constitution which inevitably forces them into phthisis, despite where they go or whatsoever they do to antagonize it, come and realize benefit of radical character, find their tendencies to the disease bridged over, and that they gradually arrive at a plane of better general health than they have hitherto enjoyed, and, notwithstanding an active engagement in the affairs of life, wear well—*do well.*

So much in a general way as giving a very imperfect outline of the complexity of the results of consumptives, actual or predisposed, coming to Colorado for relief.

The question naturally enough presents: In what respect do these results differ from those that would follow sending the same parties, for example, to Minnesota, or selected cases to Minnesota, southern California, the Bermudas, Australia, or south coast of the Mediteranean? What class of cases should come to Colorado with promise of benfit? What the features in a case of phthisis pulmonalis which should deter the individual from placing his case under the topographic and climatic conditions furnished by Colorado, or render it quite probable that he may fare as well and live as long, or longer, at home, or some other resort, than ours?

It is the *stage* of his affection, or the *variety*—the type—or both?

I think it may be truthfully asserted that not a few physicians, and the majority of consumptive invalids, entertain the idea that if the latter come to Colorado early in the attack, benefit will necessarily ensue, leaving out a consideration of the type of the ailment. This is not altogether true of at least one class of cases, as I shall endeavor to show in the future of this report: nor is it necessarily true in reference to those cases for whom there is benefit in our climate and elevation, at certain other stages of the affection.

With the exception of a single class, there is a proper time to come, doubtless, but that proper time is not always what might be termed the first stage of the malady. Of less doubtful propriety would the change be, if made anterior to the "first stage," for it is impossible to over-estimate the importance of resorting to appropriate means, whether medicinal, climatic, hygienic, or dietetic, on the mere hint of the approach of so unmanagable a disease as ordinary pulmonary consumption.

As giving a more distinct idea of the thought which it has been attempted to outline in these introductory statements, it is only necessary to remind you that some consumptives come here in the "first stage" of the affection and do well; that is, if you follow them up until they die on the one hand, or they get well on the other hand—an event you occasionally witness—you are forced to the conclusion that the history of their cases has been a more favorable one than if they had done anything else than come to Colorado.

Others of this self-same class, as relates to "stage" of the affection, but differing in type and inherent tendency, die, you are assured, quite as quickly, nay, even more so, than had they remained at home, or sought other topographic and climatic influences than those to be found here.

Others come to us with a large cavity in the lungs, and shortly after their arrival begin to regain health; the appetite improves, night sweat abates, diarrhœa ceases, sleep is more restorative, excessive and wasting expectoration diminishes, and moist, cavernous, sounds are exchanged gradually for dry, harsh respiration. And all this might have occurred, had the patient remained at home, or gone somewhere else.

Still others come to us, and shortly after their arrival, a hemorrhage from a cavity chokes them to death, or the increased demands made by the change upon the respiratory apparatus are greater than can be fulfilled; dyspnœa is aggravated, insomnia follows, the appetite fails, peripneumonic and bronchitic phenomena supervene, semi-cyanosis is established, and death supervenes; but how much more rapidly than if they had remained at home, or gone elsewhere than here?

Out of this multiplicity of phenomena, apparently contradictory in itself, who within hearing, or even within or outside the limits of this State, has the temerity to assert that the task is an easy one of formulating rules indicating what class of consumptives can or should come here with safety and profit to their health, and what not?

Consumptives live for years in those regions of the eastern part of our continent, where in every 10,000 deaths from all causes, over 2,000 are from the malady under consideration. In the same localities they also perish from it and its complications, in a fortnight to a few weeks. Can we say that the same does not occur in Colorado? or cannot occur? Portal has said "consumption lasts from eleven days to forty years," and might truthfully have added: No spot on God's footstool, inhabited by the children of men, is exempt from it.

It originates in Colorado, as everywhere else under the shining sun, where men tarry. (See City Physician's Report for the year ending, April, 1876.)

But while these are facts, nothing in medicine is more conclusively established than the propositions: That it is much more prevalent in some localities of the earth, independent of the influences of occupation and habit, than in others; that under certain climatic, hygienic and social conditions, the average duration of the disease is longer or shorter, as these conditions are favorable or unfavorable.

Again, other well established facts in the science of medicine are: That the phenomena grouped under the term, "pulmonary consumption," are numerous and diversified; that the inherent tendency to the disease manifests *every gradation* of intensity imaginable; and, that based on varying inherent or acquired tendency, as dependent on mode of origin of the attack in relation to the anatomical element, or elements, of the lungs involved in the same, wide differences of symptoms and signs present almost irreconcilable with the custom of applying one cognomen to so varied a series of phenomena. The latter difficulty is partially surmounted, of course, by dividing the cases into groups, or *varieties*, and employing adjectives to distinguish the groups.

Thus is it that leading varieties of the disease are commonly spoken of as, e. g: "Filroid Phthisis," "Acute Phthisis," "Hemorrhagic Phthisis," "Ordinary Phthisis," "Chronic Phthisis."

Elsewhere in the world, and notably in English practice, the observations of cases of consumption of the lungs have been so carefully made and analyzed, that the leading differences have not only been so clearly pointed out as to make typical cases of each variety easily distinguishable, but tables of "expectation of life," so to speak, for each class of cases have been constructed; such tables relating more, however, to the *average relative duration* of the ailment, as manifested in a number of cases representing a variety of the disease, than as relating to the absolute number of months or years the individual will survive; so that, if x equal the mean length of time which a subject of "acute phthisis" lives, after the first symptoms present, 3 x will equal the mean duration of life of the subject of "chronic diffused tulurcle," from the date of the initiatory symptoms till death.

"Ordinary phthisis" would be represented by $x + \frac{x}{2}$, etc.; (Pollock).

The average duration of phthisis, "all forms of the disease being taken together," has been variously estimated.

Laennec considered it to be	24 months.
Louis and Bayle (314 cases examined) mean duration . . .	23 "
Andral, cases in La Charite	24 "
Sir. James Clarke, taking cases in the upper classes of England, with all advantages for the care of health, ...	36 "
C. J. B. Williams, by the use of cod oil	48 "

(Pollock).

It remains then for the medical profession of Colorado to carefully examine the cases of this disease coming here for relief, to take notes of such cases, and of the length of time they remain here, how long sick before coming, follow them up vigorously, note important differences or similarities, and finally, after an unprejudiced analysis of a sufficient number of such cases, establish, as nearly as possible, tables exhibiting the "expectation of life" for the leading varieties of consumption, and then, by comparison with similar observations made elsewhere, and only in this way, can it be determined, whether the ordinary consumptive lives longer in Colorado than in some of the neighboring states, or than in England, France, or Germany; whether the subject of certain varieties, or certain stages of any variety, do better or not so well, as they might do elsewhere in the world.

Individual opinion, not based upon an analysis of a reasonable number of cases, passes in competent medical circles for just what it is worth—very little.

What is needed is a record of cases and observations. Careful analysis *of a large number of such* cases will inevitably lead to correct conclusions, and we may thus beome the depositories of valuable information to sufferers from this world-wide evil.

As a feeble beginning in this direction, for the past eighteen months, I have kept a record of perhaps half the cases I have examined.

A number of such cases were examined but once, for the reasons that they either died shortly afterward, went to a different part of the state or elsewhere, passed into some other physician's practice, or quit treatment altogether.

Not infrequently the notes were written hurriedly, and the answers to important interrogations omitted: the record is consequently nothing like so complete as I would desire it to be.

I ask the privilege of presenting it, however, for simply what it is worth.

It will at least demonstrate a few facts, as for example: The *variety* of the cases coming here for relief; the failure or success in individual cases of finding it; and occasionally, an instance of apparent complete restoration to health.

I have *heard* of some very remarkable recoveries from consumption since coming to Colorado; heard of some of them, in fact, before coming. It is quite probable others have seen such cases. They may have encountered a more favorable type of the disease than I. These cases are said to be scattered through the mountains, up on Bear creek, out on the Bijou, over in the Parks, on the Divide, or down at Manitou or Colorado Springs; and doubtless representatives of the kind could be found in each of the localities mentioned, but still it would be pleasant to have notes of their cases—the result of physical examination of the chest—an account of their condition "before taking" and "after taking." It is the only way to clinch the argument.

CASE 1. NOVEMBER, 30, 1874.

Ordinary Phthisis Pulmonalis; Cavity in Apex of Right Lung.

Mrs. M——, aged 30; married; greatly emaciated; exceedingly nervous, with occasional hysterical manifestations. Has had frequent attacks of diarrhœa for several months; eats well, but receives slight benefit from her food. Pulse 106. Respiration 24.

Inspection:—*Infraclavicular depression*, and *defective superior costal movement*, right, amounting to absence in subclavicular space. Exaggerated costal movement, left.

Palpation:—Exaggerated vocal fremitus, right; left, normal.

Percussion:—Marked dullness above, over, and below clavicle, shading off gradually to lower margin of mammary region, right; high-pitched osseo-cavernous note supra-spinatous, dullness infra-spinatous, with normal pulmonary resonance base, right.

Exaggerated pulmonary resonance front and back, left, of vesiculo-tympanitic quality in supraclavicular region.

Auscultation:—Loud tubular respiration infra- and supra-clavicular regions, right, with obscure, but coarse rales, over former in ordinary respiration, though on deep inspiration and cough, cavernous rales. Subcrepitant and sonorous rales mammary region. Bronchophonic voice below clavicle.

Cavernous respiration supra-spinatous, right; coarse mucus rales infra-spinatous, with subcrepitant rales interscapular region, and exaggerated respiration towards lower and outer boundary of infrascapular region.

Left anterior:—Supplemental respiration, except at a point midway under clavicle, over second interspace, where, from the vesiculo-tympanitic quality of the percussion note, weakened inspiratory *sound, prolonged* and low-pitched expiration, the existence of an emphysematous area *is suspected.*

Physical examination made a few days subsequent to the above, corroborated, in all leading particulars, the observations here recorded.

By the advice of Dr. W. H. Newman of this city, through whose kindness I was called to see the case, and fully concurring with the gentleman, the patient returned to Kentucky, our prognosis being decidedly unfavorable, and the husband expressing a wish that, if his wife must die soon, he, as well as herself, would much prefer the event should overtake her at home midst her relatives and friends. She died shortly after her arrival in Kentucky. The elements of an unfavorable prognosis in this case were:—

1. The type of the case—ordinary phthisis.
2. The actual state of the right lung—large cavity in apex and extensive surrounding consolidation.
3. Loss of integrity of alimentary canal.
4. Great emaciation.
5. Incredible irritability of the nervous system.

My own observation leads me to conclude that where the last three elements prevail in a case of phthisis pulmonalis, such a case will approach the crisis of dissolution more rapidly at this elevation (5,200 feet) than at sea-level; and especially is this declaration true when, in addition, an extensive aerating area (2) in either lung is cut off by disease.

CASE II. AUGUST, 1874.

Chronic Pneumonia (?); Sub-Acute Pleurisy, attended with Extensive Effusion.

A—— K——, aged 35; male; light hair and complexion; pulse slightly accelerated; feels pretty well; dyspnœa on exertion; appetite fair; coughs some.

Inspection:—Right chest completely motionless during inspiration; intercostal depressions effaced; movements of left chest exaggerated.

Mensuration:—Right chest on level of sixth costo-sternal articulation, two inches larger than left.

Palpation:—Vocal fremitus absent, right; normal, left. Apex beat of heart, one and a half inches to left of normal, and somewhat higher than usual.

Percussion:—Right chest universally flat; left, resonance slightly exaggerated, except as modified by displacement of heart.

Auscultation:—Entire absence of respiratory sound, over right; supplemental respiration, left.

The subject of this sketch had been in the Territory over one year, in the search of health, relying exclusively on the curative powers of the climate, and supposed he was a sufferer from "chronic pneumonia," as a distinguished physician in St. Louis, Mo., had examined his chest fifteen to eighteen months previously, and pronounced him a victim of the latter malady—a correct diagnosis at the time, no doubt. He stated that he was also advised, by the same party, to come to Colorado, live on wholesome, nutritious diet, take exercise in the open air, and trust to the recuperating effects of the climate, for cure.

I could but fully concur with Dr. E. Warren Sawyer, since of Chicago, but at that time in this city, and through whose kindness I was invited to examine the case, in the opinion, that the patient had been trusting in the climate many months longer than had been to his advantage, uniting in recommending aspiration of the fluid pent up in the right chest. But the diagnosis was so at variance with the patient's preconceived notions of the case, and the proposed method of relief so distasteful, that he declined, or neglected to submit to the treatment best calculated to give relief.

He remained six weeks or two months after the examination, and returned to Illinois. Subsequently learned indirectly that he submitted to the proposed operation, with benefit. Have not since heard from the case.

This case has been reported, in the present connection, as an instance of the remarkable power of adaptation in man to his physical surroundings. With an embargo on respiration in the right lung, from apex to base, the patient led a comparatively comfortable existence in the rarified air of this region.

I wish to make one more comment, before passing to the next case: Like many others coming here for the relief of pectoral ailment, he was instructed by his physician, east, to "*trust to the climate.*" This advice, so frequently given by the physicians, east, on sending their patients here, if adhered to long, usually redounds to the injury of the latter. Climatic influence alone is frequently not sufficient to secure restoration to health; and a harrassing cough, or a distressing night sweat; an impaired appetite, or a colliquative diarrhœa, need as prompt attention here, as in other parts of the world, to say nothing about the value of advice relating to exercise under the changed surroundings of the patient, viz: rare air, great diurnal variations of temperature, wind storms, excessive dryness of atmosphere.

CASE III.

Threatened Phthisis Pulmonalis, after Pneumorrhagia and Pneumonia.

J. W. S——, examined September 16, 1874; aged 40; rather muscular; dark complexioned; deep temporal fossæ. Has had several attacks of pneumorrhagia and pneumonia, and for some months past, cough. Complains of aching in the limbs and weariness, and has marked exacerbations of fever every afternoon. Pulse 115.

Careful examination of the chest failed to elicit marked evidence of disease, though the respiratory murmur universally, was rather feeble, and a slight elevation of pitch in the percussion note, over the right mammary region, was observed. Peribronchial thickening, in connection with the right bronchus, was suspected.

As he was recently from a malarial region, his *malaise* and fever were thought to be dependent, in a measure, on that source of disease, and accordingly anti-periodic doses of quinine were administered every forenoon, and gtts, iv Liq. Pot. Arsenit, in mixture, after meals. Soon lost sight of, and have not since heard from, the case.

CASE IV. AUGUST, 1874.

Ordinary Phthisis Pulmonalis; Great Dyspnœa; Progressive Anæmia.—Death.

Miss M. V——, a blonde of medium hight, aged twenty-four, deep temporal fossæ, here recently from St. Louis, Mo., where she contracted her disease while pursuing the vocation of seamstress; has had several hemorrhages from the lungs, amounting at times to three or four ounces. Has maked dyspnœa; has lost much flesh and strength; face and buccal mucus membrane pale, pulse 120, complains of palpitation of the heart; dyspnœa aggravated since coming to Denver; the catamenia have been absent for several months. No discernible hereditary taint; one brother weakly and throws off "cold" slowly.

Inspection:—Diminished costal movement, right and left, superiorly; most apparent left.

Palpation:—Nothing worthy of note.

Percussion:—Dulness superiorly, right and left, front and back, most pronounced left.

Auscultation:—Prolonged expiration of high pitch, superiorly, right; bronchial respiration superiorly, left, front and back; "apex catarrh," ditto.

Has taken a good deal of cod oil, and as appetite is now poor, prescribed:—

℞ Acidi nitromuriatici,	f.ʒ iss.
Aquæ fontanæ,	f.℥ iv.

M. S. One teaspoonful in a wine glass of water, before meals.

℞ Quiniæ sulphatis,	grs. xxx.
Ferri pyrophosphatis,	grs. xl.
Extracti nucis vomicæ,	grs. x.

M. ft. pil. No. xxx. Sig: One three times daily.

In opposition to my advice, but in consideration of the depleted condition of her exchequer, she went *to a higher altitude*, where she had an acquaintance, and could procure cheaper accommodations.

February 25, 1875. Returned to Denver two weeks since, and, influenced by a gentleman invalid friend, employed a notorious quack and ignoramus to attend her, who insisted that her principal ailment was uterine, that nothing short of a vaginal examination would disclose the nature of the malady, and relief could not be anticipated unless treatment were directed to an amelioration of the uterine malady.

Intuitively discerning the presence of the fraud, and hence positively refusing to submit to the proposed examination at *his* hands, yet consenting to take his treatment for a time, this human ghoul placed her on placebo cough mixtures, and vomited her three or four times daily, by administering a species of devil's broth containing lobelia.

Rapidly sinking on the villianous treatment, and sending an urgent request for me to see her, I called on the above date.

Found her almost skeletonized, appetite execrable, diarrhœa and drenching night sweats, most harrassing insomnia, tendency to bed sores, alæ nasi sharply curved upwards and features pinched, respiration 40 per minute, axillary temperature, 10 a. m., 102.° Ordered:—

℞ Zinci oxidi,	grs. xii.
Extracti conii solidi,	grs. vi.

M. ft. pil. No. vi. Sig: One at bed time.

Also: ℞ Quiniæ sulphatis,	grs. xxxii.
Pulveris digitalis,	grs. xii.
Extracti conii solidi,	grs. viii.

M. ft. pil. No. xvi. Sig: One three times daily.

To control diarrhœa:—

℞ Bismuthi subnitratis,		ʒ iss.
Tincturæ catechui, Tinturæ opii deodoratæ,	âa	f.ʒ iss.
Tincturæ camphoræ,		gtts. xlv.
Aquæ cinnamomi,		f.ʒ ix.
Syrupi zingiberi,		f.℥ ss.

Ft. mistura. Sig: Shake well; one teaspoonful after each action, 'till diarrhœa reasonably checks.

Ordered rum and milk punch, Valentine's extract of meat, and yolk of eggs in milk brought to the boiling point and skimmed.

She was too prostrate to submit to physical examination of the chest.

Feb. 26th.—Slept better last night than for two weeks previously; feels stronger.

Inspection:—Hurried, shallow respiration, with defective costal movement superiorly, right and left, front.

Palpation.—Gurgling fremitus, left infra-clavicular.

Percussion:—Dulness superiorly, front and back, left and right, most marked above and over left clavicle. Normal resonance base, left and right, posteriorly.

Auscultation:—Well marked cavernous respiration and coarse, moist rales, left infra-clavicular and superior portion of mammary regions; ditto posteriorly to two inches below spine of scapula.

Bronchial respiration and sub-crepitant rales, superiorly, front and back, right: supplemental respiration posteriorly, right and left, most marked over the former.

The pulse and temperature record for the succeeding nine days, though somewhat incomplete, will be given, as showing the supposed effect of quinine and digitalis in moderating the circulation and temperature, as well as the results of the introduction of alcoholic stimulants and appropriate foods—hydro-carbons—for the respired oxygen to play upon, rather than leaving the tissues wholly to its mercy, as had been the case for two weeks previous to my visit on February 25.

Feb.	26.	Pulse,	10:20 a. m.,	146.	temp.	102.5°
"	26.	"	5 p. m.,	146.	"	104.5°
"	27.	"	2:15 p. m.,	136.	"	———
"	28.	"	11 a. m.,	124.	"	98.8°
"	28.	"	5:30 p. m.,	136.	"	———
Mar.	1.	"	4:30 p. m.,	126.	"	98.8°
"	2.	"	5 p. m.,	120.	"	98°
"	3.	"	4:30 p. m.,	96.	"	99.2°

Vomited this morning; took very little food or stimulant during the day; discontinued the digitalis in the pills.

Mar.	5.	Pulse,	5:30 p. m.,	112.	temp.	———
"	6.	"	4:30 p. m.,	104.	"	99°
"	10.	"	5:30 p. m.,	108.	"	———

The night of Feb. 28 being a sleepless one, the following mixture was ordered:—

℞ Potassii bromidi,		ʒ i.
Chloral hydratis,		grs. xl.
Aquæ fontanæ, Syrupi tolutanus,	âa	f.℥ iss.
Tinct. card. comp.		f.℥ i.

M. Sig: Two tablespoonfuls in water at late bed time, to be repeated in the dose of one tablespoonful in an hour, if not asleep.

The use of this compound very much *soothed* the irritable and wide-awake nervous system after the first night, and on its further use, sounder and more refreshing sleep was obtained towards morning and during the forenoon, than had been enjoyed for weeks before.

Owing, however, to the patient's very anæmic and prostrated condition, it was feared that the prolonged use of the chloral hydrate might prove deleterious. The use of the above mixture was accordingly suspended, and the following ordered:—

℞ Tincturæ opii deodoratæ,
Tincturæ hyoscyami,
Extracti humuli fluidi,
Syrupi zingiberi, } āā - - - f.℥ ss.

M. Sig: A teaspoonful at bed time, to be repeated once an hour, if necessary. This seemed of avail in procuring rest and sleep.

With increasing gravity in the physical signs, and gradually declining strength; with night sweats of an exceedingly distressing character to the last, notwithstanding the use of cold sage tea, aromatic sulphuric acid, oxide of zinc, gallic acid: with a more favorable state of the bowels than when the treatment began, and a voracious desire for solid, and even animal food, she died on the morning of March 17. The expectoration for some time preceding and during the last attendance on the case, was heavy and muco-purulent, coming up in large, roundish masses, with fleecy appendages, and sinking rapidly when spat into water.

The prognosis given to her friends shortly after her first arrival in Denver was unfavorable, the leading elements upon which the conclusion was based being:

1, Involvement of both lungs: 2, The damaged integrity of digestion and assimilation; 3, The frequency of the pulse; 4, The profound anæmia; 5, Marked dyspnœa; 6, Incredible irritability of the nervous system.

I have no hesitancy in making the assertion that those cases of phthisis pulmonalis which present, in the main, the above features, will die sooner at this elevation than at sea level under ordinarily salubrious surroundings.

The following case is appended as a further illustration of this fact:

Case V. November 9, 1874.

Mrs. A—— C——, aged 21; light hair and fair skin; has had cough for six months, and several attacks of pneumorrhagia. The dyspnœa is marked. Pulse 120; night sweats and diarrhœa; marked fever of evenings, preceded by chill; insomnia.

Inspection:—Respiration hurried.
Palpation:—Nothing pathognomonic.
Percussion:—Dulness left summit, front.
Auscultation:—Feeble respiratory murmur, generally; wavy inspiration left summit, front.

Ordered quinia in anti-periodic doses, and an aromatic mixture of subnitrate of bismuth, to restrain diarrhœa within bounds; cold sage tea, for sweats.

November 13th. The diarrhœa less troublesome; no abatement of fever. Ordered:—

℞ Quiniæ sulphatis, - - -	grs. xxiv.
Pulveris digitalis, - - - -	grs. x.
Extracti hyoscyami solidi, - - -	grs. xii.

M. ft. pil. No. xvi. Signa: One three times daily.

Also: ℞ Liqoris potassæ arsenitis, Tincturæ cardamomi compositæ, Syrupi zingiberi, } āā - -	f.ʒ iii.

Ft. mist. Sig: Nine drops after meals.

In a few days followed with cod oil floated on an ounce of the following mixture:—

℞ Acidi phosphorici diluti, - - -	f.℥ ss.
Tincturæ cascarillæ, Syrupi zingiberi, } āā - - - - -	f.℥ i.
Infus. aurant. comp., - - - -	f.℥ viii.

After taking the above treatment for two weeks, the patient reported at my office, much improved, there being much less fever, night sweats, and diarrhœa. Discontinued the digitalis in the pills. Presume the improvement was temporary, as I lost sight of the case for three months. Dr. Bancroft afterwards informed me that he had been called to treat the case for a time. She died in March, 1875.

CASE VI.

Disseminated Miliary Tubercle.—Pneumorrhagia; Tubercular Meningitis.—Death.

Dr. S. L. J——, an intelligent physician; examined Oct. 15, 1874; aged 35. Tall, long-figured and spare; deep temporal fossæ. Experienced several intense attacks of pharyngitis last winter, while practicing his profession in Iowa. Has had several attacks of pneumorrhagia; coughs considerably; expectoration slight; pulse 120; temp. 102,° 3 p. m.

Physical examination of chest revealed defective antero-posterior diameter, and universally weak respiratory murmur. Forced inspiration developed fair costal movement.

There was marked dyspnœa, and the cheeks were crimson. Complained of a burning sensation in the palms of the hands. Two weeks later, symptoms indicative of tubercular meningitis supervened, and as the case progressed, all shadow of doubt in reference to the character of the supplemental affection disappeared, for there were vomiting and constipation; intense headache and intolerance of light and sound; insomnia, delirium and cutaneous hyperæsthesia; irregular pulse and sighing respiration; coma, dilated pupils, oscillating irregularly on exposure to light; convulsions and death.* Even the peculiar "hydrocephalic cry," or utterance, was made. No *post mortem*.

The notable feature in this case, is the tubercular meningeal affection at so advanced an age. It appeared to be an instance of *metastasis*, so to speak; the pulmonary affection disappearing in the back-ground, on the supervention of the meningeal disease.

The writer has witnessed several somewhat similar cases to the above, since coming to Colorado, and they have suggested the idea that tubercular disease of the meninges of the brain, in persons suffering from pulmonary tubercular affection, is a rather more frequent sequel to the latter affection in this State, than in the Mississippi Valley States, rendering somewhat probable the hypothesis that our climatic conditions, while favoring in many instances the amelioration of the pulmonary malady, fails to mitigate the dyscrasia, when well marked, upon which such malady depends, but which, continuing, manifests in some other portion of the body, and proportionately frequently in connection with the nervous system, by reason of the well known tendency of the latter to suffer irritation under the continued influence of the two leading characteristics of this climate, viz: dryness and an excess of electricity in a peculiar state of tension.

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*No albumen in the urine.

CASE VII. NOVEMBER 9, 1874.

Incipient Ordinary Phthisis; Insomnia from Climatic Influence.

Mrs. G. A. S——, age not definitely known; probably under 30; wife of a very intelligent physician; *petit*, and of nervous temperament; brown hair; deep temporal fossæ; has had two attacks of pneumorrhagia within the nine months passed; pulse 90.

One sister had hemorrhage from the lungs at the age of 27, and a marked decline of health, threatening the development of phthisis, but three years subsequently had regained her health to a very considerable extent· History of parents not remembered.

Inspection.—Nothing worthy of note.
Palpation:—Ditto.
Percussion:—Slight dulness right supra-spinatous region.
Auscultation:—Weak vesicular murmur universally; wavy inspiration right infra-clavicular region.

A physical examination one month subsequent to the above revealed no material change.

About this time Dr. W. H. Williams of this city, also made a physical examination of the chest, and concurred with me in the statement that definite lung lesion, as revealed by physical exploration, was certainly very slight, if indeed noticeable.

In giving her husband, by letter, the result of the physical examinations, stated; "Mrs. S——'s hemorrhages undoubtedly proceeded from that frailty of the pulmonary vascular tissue which so frequently precedes, and accompanies, Phthisis Pulmonalis. I consider her, in what might be aptly termed 'the pretubercular state.'"

She was greatly annoyed with inability to sleep, the insomnia increasing markedly in still, clear, intensely dry weather; as a result, the appetite failed, notwithstanding the use of stomachic corroborants; and there were wandering pains in the chest, and slight cough. Returned to Ohio in December.

About three months subsequently, Dr. Austin Flint examined the case, and found slight tubercular deposit in the summit of the left lung.

The following summer, accompanied by her husband, she returned to Colorado, had two or three attacks of pneumorrhagia—one excessive—and after remaining in Denver two to four weeks had a return of the insomnia, followed by its usual results. Signs of softening supervened; and her husband wisely concluded the locality was not suited to the peculiarities of the case, and returned east, making a detour through Minnesota, and contemplating sending her to the Bermudas to winter.

The dry, stimulating character of the climate here, evidently rasped this patient's nervous system, and was one of the leading factors in the production of the insomnia which was so marked a feature in the case.

CASE VIII. NOVEMBER, 1874.

Extensive Dulness, Right Summit; Healthy Appearance. Subsequent Progressive Decline.

B—— W——, aged 36; plasterer; fresh, florid complexion, with large head and small chest; pulse 76; has had cough for several months, family history not obtained.

Inspection:—Diminished costal movement right front.

Palpation:—Increased vocal fremitus entire right front.

Percussion:—Dulness right summit, front and back, shading off to lower border of mammary region, and extending posteriorly to lower angle of scapula.

Auscultation:—Tubular breath and voice right infra-clavicular and supra-spinatous regions. Broncho-vesicular respiration and exaggerated vocal resonance right mammary, with deep seated crepitation elicited on forced inspiration. Tubular breath and broncophony right infra-spinatous region.

Supplemental respiration, summit left. In the act of coughing, a tumor the size of a filbert suddenly appeared in the second intercostal space near the right edge of the sternum, and as suddenly disappeared on the cessation of the act. It was supposed to be a varix of the intercostal vein.

Dr. Newman of this city, to whom I am indebted for the above examination, informs me that the patient's health continued to decline, signs of excavation eventually presenting, and that he returned to Kentucky in a very precarious condition, in July, 1875. Case not heard from since.

CASE IX. NOVEMBER 10, 1874.

Hemorrhagic Phthisis; Extensive Solidification of Summit of Right Lung; Tendency to Chronicity,

A—— D—— (Examined by invitation of Dr. Newman); a saloon keeper, aged 40; fine *physique*, florid complexion; pulse about 90. No hereditary tendency. Had hemorrhage from the lungs four years ago last March, for the first time; the attack recurred frequently for two years thereafter: was at the time a resident of Chicago; came to Colorado; was exempt from hemoptysis for nearly two years after arriving here. Hemorrhages returned, quite profuse at times, amounting in one instance to nearly a quart. Is now expectorating muco-purulent sputa, largely mixed with blood.

Inspection:—Reveals defective expansion superiorly, right.

Palpation:—Nothing worthy of note.

Percussion:—Universal dulness, right, most marked above and below clavicle, and least apparent at outer and inferior edge of scapula. Left normal.

Auscultation:—Crepitant and sub-crepitant rales right, front and back, superiorly; mucus rales mammary and infra-mammary regions; distant sub-crepitant rales infra-spinatous and inter-scapular regions, as well at inner and inferior angle of scapula.

There was a well marked systolic blowing sound with area of greatest intensity near left edge of sternum, over second intercostal space, shading off gradually two inches to the left, not heard elsewhere.

The last hemorrhage—a light one—occurred three days since. The patient states that, altogether, he has had over one hundred hemorrhages from the lungs.

May 26, 1876. He had two attacks of hemoptysis since last examined, one in May, 1875, and one ten days since; the former quite profuse.

Dulness over right summit, back, and nearly to lower angle of scapula. Tympanitic resonance under corresponding clavicle, with high pitched dulness above same. Diminished resonance mammary region. Cavernous respiration right infra-clavicular region, pectoriloquy, and coarse mucus rales; broncho-vesicular respiration, and exaggerated vocal resonance, right mammary region. Defective breath sounds of tubal type above and over scapula, right.

It will thus be seen that excavation of the right apex has occurred since the last examination in November, 1874. There is, however, much less adjacent pneumonia, and surrounding pneumonic infiltration has cleared up to a large extent. The patient takes about six ounces of whisky daily. The blowing sound over the pulmonic valve exists with its former intensity. He has now been in Colorado over four years. At this time his appetite is fair, and his weight about up to the standard of the last four years.

CASE X. DECEMBER 30, 1874.

C. M. W——, aged 26. Has had cough for thirty months; has never had hemoptysis. No hereditary tendency. Has been in Colorado three years.

Inspection:—Reveals feeble respiratory movement—the chest walls nearly motionless in ordinary inspiration.

Vesicular murmur exceedingly feeble; dulness, with loud tubular respiration, right infra-clavicular region.

From leading a sedentary life formerly, is now out doors much of the time, in consequence of which the general health has very much improved. Slight cough much of the time, and mucus expectoration, especially in the morning.

CASE XI. JANUARY 21, 1875.

J. McK——, aged 24; arrived here a few weeks since from Canada. Is suffering from a severe attack of hemoptysis which was ushered in three days since.

Too debilitated to submit to critical examination of the chest; was called to see the case in the absence of Dr. A. Steadman of this city—his regular attendant.

Had what his physician in Canada called an attack of pneumonia, last June, and has not been well since.

Auscultation:—Reveals loud canvernous respiration and gurgling under right clavicle; respiration normal, left anterior.

The hemorrhage was very profuse and clearly from the cavity, increasing to a marked extent afternoons and evenings, corresponding to daily exacerbations of fever.

He subsequently, as I have been informed by Dr. Steadman, fell into the hands of the notorious quack to whom allusion has been made in the report of case IV, who, in obedience to his usual custom in all cases of the kind, put the patient on spare diet and administered emetics. I cannot learn, however, how long this villainous practice was kept up; but can record the fact of the patient's death, which took place in April, 1876.

CASE XII. MARCH 19, 1875.

Chronic Phthisis; both lungs involved; Cavity in Apex of left. Sudden death from Hemorrhage.

J. W. F——, aged 30. Father died of typhoid fever, aged 45; mother of phthisis pulmonalis, aged 42; mother's brother died of hemoptysis at 36; grandmother, on maternal side, also died of pulmonary consumption.

The subject has dark hair and complexion; deep temporal fossæ; has had cough for eight years, and two attacks of hemoptysis; the first in 1867, amounting to a half pint, and the second in 1872, amounting to a gill.

The patient was in bed, and hence a critical examination of the chest was not attainable; but the following facts were ascertained:—

Dulness on percussion, cavernous respiration, cavernous voice, and coarse rales under left clavicle, as also posteriorly above spine of scapula. Dulness, prolonged expiration, and sub-crepitant rales, left mammary and inframamary regions, with defective respiration posteriorly below spine of scapula. Decided "apex-crepitus" front and back, right.

Gained appetite, flesh and strength, on appropriate treatment, and, with few exceptions, did well, considering the extent of damage to the pulmonary texture, until December 25, 1875. On the latter date, while leisurely walking along the street, was seized with a hemorrhage from the lungs which choked him to death in less than five minutes, causing him to falter and sink down in his tracks, the blood rushing from the mouth and nostrils.

CASE XIII. MARCH 30, 1875.

A. J. McG——, dentist, aged 37. Pulse 110; has never had hemorrhage from the lungs; has flaxen hair, light complexion, deep temporal fossæ.

Had "bilious pneumonia" in Iowa, four years since. The lung attacked —the right—resolved slowly. Has had constant cough and dyspnœa for two years. The muscles are extremely flaccid, and the adipose tissue scant; the appetite variable, and nervous system irritable.

Diminished resonance left summit, front and back; most apparent front. Vesiculo-tympanitic resonance elsewhere, left. Rude respiration left summit, front and back, with indistinct crepitus; the latter most marked over the supra-spinatous region. Exaggerated respiratory murmur left base: Diminished resonance, suppressed murmur, and sub-crepitant rales, right mammary and infra-mammary regions.

Loud, prolonged expiration right summit, front and back; marked dulness supra-spinatous region, with sub-crepitation over base of lung.

June 1, 1876. Lost flesh and strength progressively during the winter; signs of excavation, left summit; defective respiration and sub-crepitant rales, right front; utter loss of appetite, and distressing diarrhœa; will inevitably soon sink.

CASE XIV. APRIL 3, 1875.

Disseminated Tuburcle; Grave Constitutional Disturbance; Death in about One Year.

Mrs. C. S. S——, aged 33; has had eight children, five of whom are living; has dark brown hair, and deep temporal fossæ. Has had cough and decline of health for one year. Spat blood last July; also again in August.

Mother is asthmatic, aged 53. Father's health good, aged 62. Brothers and sisters in good health. Has menstruated regularly up to last period which was missed; no leucorrhœa. Pulse 128, 10 a. m.; dyspnœa marked; aphonia; coughs almost incessantly; sputa tough, roundish masses, for the most part not sinking in water, and of "peach bloom" color.

Inspection:—Deficient right costal movement.
Palpation:—Nothing worthy of note.
Percussion:—Dulness left summit, front; tympanitic resonance right front.
Auscultation:—Wavy inspiration left infra-clavicular region and "apex crepitus." Tubular respiration right summit, broncophony, crepitant and sub-crepitant rales.

Mrs. S. arrived here a few days since from Du Quoin, Illinois, where she contracted her disease.

For sometime past, she has had daily slight chills, followed with intense fever, crimson cheeks, and night sweats. Treatment directed to reduction of evening exacerbations of fever, mitigation of cough and sweats, and improvement of the appetite.

April 4. 8.30 a. m., Pulse 125, temp. 101.1°
" 4. 3.30 p. m., " 126, " 103.8°
" 6. " " " 126, " 103.°
" 8. " " " 114, " 101.1°

Tongue cleaner; appetite better; cough looser.

April 11. 4 p. m. Pulse, 132, temp. 103.8°
" 16. 11 a. m. " 128, " 101.1°

Had chill this morning; cough and expectoration unchanged. Ordered eight grains of sulphate of quinine to be taken daily, early in the morning, and three drops of Fowler's solution, after meals. After the second day of this treatment, the chill and fever were less decided, a return to more moderate doses of the quinine was ordered, and the Fowler's solution discontinued.

On April 18, and during my absence from the city, her nurse gave her *boiled cabbage* for dinner. It underwent putrefactive fermentation in the alimentary canal, produced violent irritation of the bowels, diarrhœa, and great depression. The pulse ran up to 140; great dyspnœa supervened, jactitation and insomnia followed, and death occured on the morning of April 24.

CASE XV. APRIL 15, 1875.

Pneumonia, Followed by Phthisis, Rapidly Terminating in Cavity.

A. G. E——, aged 28; butcher. Parents living and healthy. No scrofula, asthma, or consumption on either side of the house. Was exposed to great inclemencies of weather in Iowa last winter, while plying his vocation. "Caught cold" in January, and has had cough since. About February 1, had an attack of what his physician called pneumonia; but was scarcely confined to bed by it. Has not spit blood, pure, or mixed. Is slightly hoarse, coughs harrassingly, and expectorates heavy, tough mucus; marked dyspnœa. Pulse, 2:30 p. m., 120; temp. 100.8.°

Inspection:—Right chest largest; defective costal movement, ditto.

Palpation :—Nothing worthy of note.

Percussion :—Diminished resonance over entire right chest, especially apparent on forcible stroke. Left normal.

Auscultation : — Diminished vesicular murmur entire right; broncho-vesicular respiration above clavicle ; crepitant and sub-crepitant rales corresponding to area of dulness, except above clavicle. Left normal.

Ordered syrup of the iodide of iron and iodide of potassium before meals, and cod liver oil in whisky mixture after meals. Also a digitalis and conium pill at bed time.

April 20th :—Pulse, sitting, 88 ; standing, 98. The treatment agrees well with the stomach ; continue.

April 26th :—3 p. m. Pulse 108 sitting. No essential change in the physical phenomena. Discontinued the pills and syrup of iodide of iron mixture, and ordered :

℞ Pot. iodid,	grs. xxxii.
Glycerinæ puræ,	f.℥ ss.
Ext. cimicif. fld.,	f.℥ i.
Tr. digitalis,	f.ʒ iii.
Syr. prun. virg.,	f.℥ ii.

M. S., A teaspoonful three times daily. Continue the cod oil.

℞ Olei tig.,	f.ʒ i.
Tr. iodinii,	f.ʒ v.
Olei olivæ,	f.ʒ iii.

M. Sig. Use as liniment to right chest, front.

July 22d, 1875 :—Has just returned from an extensive tour along the foot-hills, south, during which he camped. The experiment of " roughing it " was attempted at the suggestion of a friend not posted in the " dark ways " and " vain tricks " of medical science. Has encountered much rain during the trip, and had a meager, inappropriate diet, much of the time. Has lost 15 ℔s. in weight since the last examination, April 26.

Pulse 120; marked dyspnœa; appetite poor; occasionally vomits in connection with paroxyms of cough ; insomnia ; bowels constipated ; expectorates large quantities of thick, heavy, yellow matter.

Inspection :—Diminished costal movement, right.

Palpation :—Increased vocal fremitus mammary and infra-mammary regions, right. Bronchial fremitus near sternum over second intercostal space ; marked vocal fremitus right inter-scapular region.

Percussion :—Tympanitic resonance of cracked-metal-quality right infra-clavicular region. Dulness mammary and axillary regions, as also over entire posterior chest, right.

The *crack pôt* resonance disappeared in this case when percussion was made immediately after a full inspiration, the patient meantime holding the breath,—a phenomenon which occasionally occurs, as has been pointed out by Dr. Da Costa, if I remember rightly.

Auscultation :—Cavernous respiration, gurgling, cavernous voice and whisper, right infra-clavicular region.

Diminished respiratory murmur and sub-crepitant rales mammary and axillary regions ; tubular breath, broncophony and exaggerated bronchial whisper, with moist bronchial rales, over superior scapular region. Diminished vesicular murmur and sub-crepitation over base.

Left normal.

Advised him to seek a lower altitude in accordance with views expressed in the report of cases I and IV. Have not since heard from the case.

CASE XVI. APRIL 16, 1875.

Chronic First Stage; Arrest.

B——H——, resident of Canada; agent Fire Insurance Company; aged 58; no hereditary tendency; had hemoptysis in winter of 1868-9. *Dulness and prolonged expiration below left clavicle.*

The patient is short in stature and well nourished; has slight cough, and is prone to attacks of indigestion. After sojourning here a short time, the general health improving, he went to California to recreate a few weeks, expecting thereafter to return to his business in Canada.

He took while here, nitro-muriatic acid, pepsin, and tincture of nux-vomica, with benefit to his digestion.

CASE XVII. MAY 15, 1875.

Chronic, Acquired Phthisis; Relapse from visit to States; Subsequent improvement on return to Colorado.

S. H. B——, physician, aged 46. Free from hereditary taint; deep temporal fossæ, Was surgeon of a regiment during the late war, and received a gun-shot wound of the cranium, confining him to bed for months.

Also suffered from two typhoidal attacks, which left him prostrated. Had an attack of pneumorrhagia four years since, and has experienced several attacks since. Had wretched appetite and severe cough nearly all last winter, though still attended to his duties as surgeon of Arapahoe County Hospital.

Defective costal movement left front superiorly.

Dulness left summit, front, to second rib. Tubular breath, sub-crepitant rales, croaky, bronchophonic voice, left infra-clavicular region.

Prolonged expiration, right mammary region.

Pulse frequently ranges as high as 100 to 120, of afternoons; is thin and looks haggard.

June 9th. Has just returned from a trip to Kentucky. Has aversion to physical examination of chest, on which account an examination was not made.

Has lost rapidly in flesh and strength; coughs a great deal, expectorating heavy muco-purulent matter; appetite poor.

Discontinued service at the hospital, and went to the country. While in the country, encountered a sad bereavement in the loss of his wife, which exerted an extremely depressing influence upon the case.

In July, had an attack of dysentery, confining him to bed four to six weeks, in which life was threatened from inanition and consequent exhaustion. Gradually recovered; gained appetite, flesh and strength during the following winter; cough mitigated decidedly; declined again as spring approached. Has taken a great deal of cod liver oil, first and last, though not much latterly, the treatment consisting of the use of mineral acids, pepsine, lactopeptine, the tinctures and infusions of bitter barks, quinine, salicine, and generous diet, such as porter-house beef steak, cream, fresh eggs, stale bread; rode out almost daily last winter, not infrequently driving ten or twelve miles.

At this time (June, 1876), is in a state of health permitting daily rides *of several miles.*

CASE XVIII. MAY 7, 1875.

Chronic Phthisis; Hemorrhage; Cavity in Right Lung; Intercurrent Pneumonia Lower Lobe Left, Terminating in Abscess.—Recovery.

E. J——, aged 39; sanguine temperament; has had cough for twenty years. Spat blood, amounting to 4 ozs., fifteen years since, during a marked decline in general health. Has had several attacks of pneumorrhagia since.

After the first attack enlisted in the army, serving a limited period, and was discharged on account of ill health.

Afterwards hunted buffalo on the plains and bear in the mountains. Feels better when leading an active out-door life, and especially when engaged in hunting and fishing, a species of sport in which he greatly delights. Coughs and expectorates *less when engaged in such pursuits*, and especially when he also sleeps out doors in a well ventilated tent.

The inevitable deep temporal fossæ are not wanting in this case, though not as well marked as in many instances.

Parents living; mother beyond 60; health good. Father, somewhat older, has never been very robust; has made several changes of residence in the interest of his health; has been dyspeptic, and had phthisical threatenings, at times.

At this date the patient is suffering from intense pleuritic pain in right side, and the chest is so completely enveloped in fomentations and heavy bed-clothes, the skin moist and relaxed, that a physical exploration of the thorax is deemed not advisable.

A few days subsequently examined the chest anteriorly, though unsatisfactorily, and found evidences of the existence of a cavity, right infra-clavicular region near border of mammary. More or less dulness over anterior right chest, with large and small rales variously combined. Respiratory murmur exaggerated left front, and stroke sound vesiculo-tympanitic over limited areas.

May 30th:—Yesterday morning had a violent paroxysm of cough, in which suffocation was imminent from a sudden and profuse irruption of intensely fetid, purulent matter, which was brownish in color, and contained what appeared to the naked eye to be small portions of necrosed lung tissue. For some days subsequent to the first irruption of this material he has usually experienced two paroxysms of cough in the twenty-four hours, at which times the expectoration is not only so profuse as to threaten strangulation, but possesses the characters above enumerated, and is, if possible, more fetid than before.

The stench of this expectoration, and of the patient's breath during the paroxysms of cough, beggars description, and transcends the odor of the dissecting room, or anything with which it can be compared; and is, in fact, more mephitic than any odor which can proceed from the gradually disintegrating dead body.

General condition of the patient not so favorable as when seen the last time on the occasion of the former visits; manifests a decided tendency to aphthous mouth; appetite poor, pulse 120; sweats constantly and profusely; is losing weight and strength, and becoming disheartened.

The temperature, in the afternoon, ranges from 101° to 103.° There is also diarrhœa.

Ordered teaspoonful doses, three times daily, of Wyeth's elixir of pepsin, bismuth and strychnia; also powders of sub-nitrate of bismuth and Schaffer's pepsin; and three times in the twenty-four hours a pill containing two grains sulphate of quinine, two-thirds of a grain powdered digitalis leaves, and one grain solid extract of conium.

The diet was milk, raw eggs and whisky, and beef essence.

Administered creasote inhalations thrice daily, ordered frequent changes of the air in his apartment, while to purify it of noxious odors, chloride of lime in saucers was placed in various parts of the room.

At the end of a week, improving in appetite and strength, the following tonic was ordered:

℞	Acidi sulphurici aromatici,	f.ʒ iii.
	Salicini,	℈ i.
	Tincturæ aurantii, Syrupi zingiberi, } ââ	f.℥ i.
	Infus, aurant, comp.,	f.℥ iii.

M. S. A tablespoonful three times daily, administered before eating.

A few days subsequently in place of the pepsin and bismuth compounds, the compound syrup of the hypophosphites was given. An examination of the posterior chest was now made for the first time.

Dulness along the inner edge and lower angle of the left scapula was discovered.

Auscultation revealed a short, blowing, low-pitched inspiratory sound, and a long, blowing, lower-pitched, expiratory sound, in the same regions, associated with coarse mucus and cavernous rales, cavernous voice and whisper.

This discovery somewhat astonished me, as, up to this time, I had supposed the right lung was principally involved, and that it had been furnishing the fetid expectoration. But the evidences of destructive disintegration in the lower lobe of the left lung, posteriorly, were so unmistakable, that I could not escape the conclusion that, if there was a cavity in the apex of the right lung, anteriorly, there was a still larger one in the lower lobe of the left lung, at the inferior angle of the scapula.

This discovery also impressed upon my mind the importance of not assuring a patient that his one lung is in a normal condition, without a previous minute examination of every square inch of his chest; for, finding sufficient departure from health in the right lung to explain the symptoms, as I thought, I had, in an unguarded moment, in answer to an appealing inquiry, assured the patient that the left lung was sound.

In the light of the recent examination, however, I was forced to the conclusion, that the extremely fetid expectoration heretofore described, came in reality from abscess and cavern of pneumonic origin, (necrotic pneumonia) in the lower lobe of the left lung.

The paroxysms of cough which emptied the abscess cavity about twice in twenty-four hours, became so harrassing, and usually continued so great a length of time after the cavity was emptied of its more degenerate contents, notwithstanding the administration of cough mixtures containing morphia, and the inhalation of small quantities of chloroform, that the hypodermic use of the one-sixth of a grain of the latter salt was resorted to at least once daily, with charming effect.

As the appetite improved, and digestive capability increased, porter-house beef steak, mutton chop, thin slices of broiled ham and breakfast bacon were allowed—in fact, ordered; while eggs and milk still entered into the dietary.

The night sweats were still annoying, for which the following pills were given with relief:—

℞ Quiniæ sulphatis, - - - - -	grs. xxiv.
Acidi tannici, - - - - - -	grs. xviii.
Extracti conii, - - - - - -	grs. vi.

M. ft. pil., No. xviii. Sig: One at bed time and one during the night.

June 16th. Discontinued all former prescriptions, and ordered:—

℞ Quiniæ sulphatis, - - - - -	grs. xxx.
Tincturæ ferri chloridi, - - -	f.ʒ vi.
Hall's solut. strychniæ, - - - - -	f.℥ ss.
Aquæ destillatæ, - - - - -	f.ʒ xiv.
Syr. aurant. fls. - - - - - -	f.℥ i.

M. Sig: A teaspoonful in water, after meals. Morphia hypodermically at bed time; inhalations of carbolated iodine.

The above tonic was continued for nearly two months, with immense advantage. The morphia was discontinued about July 1.

The patient began to exercise out doors, towards the middle of the latter month, and later in the season, "camped out" to his heart's content. Wintered in Southern Colorado on the Arkansas river, near Pueblo, sleeping in a log cabin, from which the "chinking" had been knocked out. Engaged in hunting and fishing, the meat supply of his table being trophies of the rod and gun.

May 20, 1876. Returned from Southern Colorado two weeks since. Not so well since return. Sleeps in the barn, second story.

Dulness right summit, front and back; ditto to greater degree mammary and infra-spinatus regions. Defective breath sounds, exaggerated vocal resonance, posteriorly, corresponding to area of dulness; cavernous respiration, and coarse rales, with marked vocal reverberation, mammary region. Diminished resonance and harsh respiration of a jerking character, left summit, front. Vesiculo-tympanitic resonance, exaggerated vocal resonance and rude respiration at lower angle of left scapula.

Gained remarkably in strength and flesh during the winter; coughs and expectorates less, and feels better in every respect when leading an out-door life—*when living out door.* Pulse 90, 11 a. m., sitting.

I present this case *in extenso*, as being not only an interesting one in itself, but as illustrating the mode of life the average consumptive should pursue, if he really be in earnest in his efforts to secure an arrest, or cure, of his malady.

This man would have died long since, had he cooped himself up in the vitiated and super-heated atmosphere of the average hotel sitting-room, and conformed to the habits of the average invalid *habitué* of the hotels.

CASE XIX. JUNE 16, 1875.

(Through the kindness of Dr. W. H. Williams of this city, I was permitted to examine the following exceedingly interesting case.)

C. R. P——, male, aged 33. Short in stature, dark hair and complexion; deep temporal fossæ; moderately well nourished. Has had cough for eight years. Has been student and teacher. Was Prof. of Latin in the

St. Louis University for two years. Had a slight hemorrhage from the lungs in 1869. Father had asthma for 30 years, died at the age of 66, of organic disease of the heart. Mother had consumption of the lungs for 15 years and died of it. The oldest sister died of consumption at the age of 28. The malady in her case was rapid in its progress, and was announced shortly after childbirth. The third sister died of the same malady at the age of 22, as likewise did the fourth sister. Each of the latter lived two years after the inception of the disease. The second sister, now in good health, is 39 years old; is short and compactly built.

Inspection :—Diminished costal movement right, superiorly.

Palpation :—Nothing worthy of note.

Percussion :—Cracked pipkin note left infra-clavicular, under junction of middle with outer third of clavicle; vesiculo-tympanitic note second interspace near sternum. Diminished resonance over mammary, infra-mammary, axillary and supra-spinatus regions; ditto infra-spinatus region. Dulness right supra-spinatus region.

Auscultation :—Cavernous respiration, voice and whisper, left infra-clavicular region towards outer border, extending downwards to third rib, with dry and rather croaky sounds; low-pitched, prolonged expiration over second interspace, near sternum, corresponding to area of vesiculo-tympanitic stroke (emphysema?)

Diminished vesicular murmur lower boundary mammary, infra-mammary and axillary regions. Apex beat one inch to left, and higher than normal. Cavernous respiration, gurgling, and whispering pectoriloquy at lower angle of scapula; tubular breath above spine of ditto. Harsh, prolonged expiration and tubal voice right summit, front and back, with sub-crepitus; bronchial rales mammary region.

May 29, 1876:—Health fair during the winter. Not so well recently, feeling greatly exhausted, and dyspeptic. Still maintains the average weight of the past four years.

Less dulness, and increased expansion, right summit, where sounds are less moist, and respiration rude. Otherwise the physical signs about the same.

The evidence of cavity in apex of left lung extending obliquely downwards and backwards is simply indubitable. There is much less catarrh of the bronchial mucus lining than when last examined. The left infra-clavicular region is sunken, and the apex beat of the heart somewhat higher than a year since.

Mr. P—— has been in Colorado four years; improved on coming here, and has doubtless had very much better health than had he remained at St. Louis, where the disease was contracted. Eminent physicians in the latter city affirmed the existence of a cavity in the left apex before he came to Colorado.

He went to Georgetown last summer, and the increased elevation, and consequent rarity of air, produced a semi-cyanosis which was intolerable, and necessitated a descent to lower altitudes.

On the whole, his is a remarkable instance of "tolerated cavity" and prolonged third stage.

CASE XX. JUNE 16, 1875.

Incipient Phthisis:—Arrest.

W. F. C——, aged 26. Father living, aged 63, health good; mother died of pneumonia at 45; two sisters died of phthisis at the age of 25, respectively. Our patient is low in stature, stoutly built, has deep temporal fossæ. Has had severe cough since last March; had hemoptysis amounting to four ounces last January, and a slight attack a few days since *en route* to Denver. Appetite poor, lost fifteen pounds weight, pulse 120, profound sense of debility, marked despondency.

Inspection :—Diminished costal movement, right infra-clavicular region.

Palpation :—Exaggerated vocal fremitus, ditto.

Percussion :—Dulness ditto, especially noticeable over third rib at junction of cartilage with same.

Auscultation :—Prolonged expiration, right infra-clavicular region ; rough, creaky expiration, inferior axillary region ; bronchial respiration, voice and whisper, supra-spinatus region. Left normal.

Gave tonics ; slightly counter-irritated right chest, front.

Remained here for perhaps ten days, outfitting for a sojourn in Middle Park.

August 26.—Returned a few days since from a tour in Middle Park. Lived out doors constantly ; engaged in fishing and gunning, by which means the table was supplied with meats and time spent pleasantly.

Inspection :—Costal movement normal.

Palpation :—Vocal fremitus ditto.

Percussion :—Less or no dulness, right infra-clavicular and supra-spinatus regions.

Auscultation :—-Expiration slightly prolonged, right infra-clavicular and supra-spinatus regions, but not beyond the physiological disparity for these regions in persons in good health. Vocal and whisper resonance less than when examined before. The creaky expiration in the inferior axillary region has disappeared.

Pulse 85 ; has gained eighteen pounds weight. Will start in a few days on a return to Middle Park, where he expects to hunt and fish until late in October ; after which will travel north until the Union Pacific railroad is reached, go to San Francisco and embark on an extended sea voyage, involving a visit to Australia. Heard from one year subsequently and in excellent health.

CASE XXI. JULY 5, 1875.

Chronic Phthisis ; Cretaceous Expectoration ; Cavity ; Death.

J. B. J——, aged 50 ; minister and teacher. Father died of diarrhœa at the age of 83 ; mother at the age of 40—cause unknown.

Three sisters have had asthma, of whom one died, aged 29, of pernicious intermittent fever.

Two other sisters, aged, respectively, 55 and 60 years, have had asthma, the former for twenty, and the latter for two years.

Another sister died of ovarian tumor.

One brother was killed in battle.

The father had rheumatism at 25.

The patient had hemoptysis when 30 years of age, the attack supervening upon severe exertion. He also had another attack in 1866, and a repetition some months afterwards ; is tall, slim, and sallow ; dark hair and complexion ; has had frail digestion for many years ; deep temporal fossœ ; coughs severely and is decidedly emaciated ; suffers from dyspnœa ; pulse 100, 4 p. m. (Has been missionary for some years to the Cherokee nation, and is presumed to be the only man living capable of writing a grammar in that language, a task he has been officially requested to perform by the Smithsonian Institute.)

Inspection :—Defective costal expansion, most marked superiorly, right.

Palpation :—Vocal fremitus exaggerated right and left, front.

Percussion :—Dulness, front and back, right, extending in front to lower edge of third rib, shading off to inferior border of mammary region; very decided in supra-spinatus region, and along inner border of scapula. Dulness left summit, front.

Auscultation:—Bronchial respiration, sub-crepitant rales, right summit, front and back; moist rales and bronchophonic voice most decided, posteriorly. Diminished breath sounds, prolonged expiration and sub-crepitus, mammary region. Ditto over body of scapula; fair respiration at base of lungs and inferior axillary region.

Broncho-vesicular respiration left summit, front.

Nov. 5. Great prostration; increasing cough and expectoration; marked and sudden swelling of left lower extremity attended with pain in popliteal space and groin.

No improvement in physical signs.

Somewhat later, left lower extremity became œdematous under the same circumstances as the right; as also did the left arm, next, (thrombosis.) There was tenderness along the course of the principal veins in the extremities involved in œdema, and a knotted condition of the same.

At this time the urine was very scant, intensely acid, quickly depositing the amorphous urates on standing.

May 28, 1876. Has gradually progressed from bad to worse. Profound prostration, severe paroxysms of dyspnœa, and great œdema of legs to abdomino-femoral fold.

Dulness right front, cracked metal resonance, cavernous respiration, voice and whisper, right infra-clavicular region. Vesiculo-tympanitic note with sub-crepitant rales mammary and infra-mammary regions.

Vesiculo-tympanitic resonance and broncho-vesicular respiration left summit, front, merging into tubal breath over mammary region.

Too prostrated to examine back.

June 2. Almost suffocated to-day from excessive bronchial and cavernous secretion, became cyanosed and too prostrated to cough forcibly.

Died June 13, 1876.

CASE XXII. JULY 28, 1875.

Chronic Phthisis; Extensive Abridgement of Function of Left Lung.

Mr. S. E. B——, aged 37; commission merchant in New York City. Parents dead; mother of pulmonary congestion at 70; father of intestinal ailment at 63. One sister died of "hasty consumption" at the age of 35. The patient is small in stature but of firm texture physically; deep temporal fossæ; hair brown, eyes dark, complexion fair; has had cough for five years and numerous light hemorrhages.

Inspection:—Marked flattening under left clavicle, and defective costal movement ditto.

Palpation:—Vocal fremitus most apparent right anterior.

Percussion:—Well marked dulness entire left, but of tympanitic quality over the clavicle. Right normal.

Auscultation:—Rough, high-pitched, tubal breath sounds left supra-clavicular, infra-clavicular and supra-spinatus regions, associated with coarse distant rales, suggestive of small tolerated cavity and extensive surrounding consolidation.

Bronchophonic voice and whisper in same situations, if indeed, the phenomena should not be termed pectoriloquous.

Deficient vesicular respiration elsewhere, left, most marked anteriorly; less so in inferior axillary and infra-scapular regions.

Right:—Supplemental respiration over limited areas.

June 10, 1876. Marked evidence of the existence of cavity in left apex; coughs incessantly; appetite wretched; night sweats alternating with diarrhœa. Had several slight hemorrhages during the winter, and a very severe attack of pleuritis.

There is great irritability of the pharynx, attended with hyper-secretion of mucus. Has, on the whole, failed rapidly during the past six weeks.

CASE XXIII. JULY 21, 1876,

Rapid Phthisis in Stone Cutter at the age of Fifty; Death in less than five months.

A. W——, male, aged 52; stone-cutter; native of Scotland, but for some years a resident of Boston, Mass. Parents died in old age, of old age. No hereditary taint discoverable.

Had an attack of pneumorrhagia first of April last, and has been rapidly declining in flesh and strength since. Was well up to that date. Arrived at Denver a few weeks since from San Francisco, California, whither he had journeyed from Boston after the attack of pneumorrhagia in April.

Coughs a great deal, and expectorates heavy, yellow sputa; pulse 120, in the recumbent decubitus: marked fever in afternoon; dyspnœa, loss of appetite, urine scant and high-colored; tongue furred with a heavy, long, slightly brownish fur; feet slightly œdematous; has a marked taste for beer which he claims allays thirst, and which he drinks to the extent of a quart daily. Night sweats.

Inspection :—Defective costal movement, right infra-clavicular region.

Palpation .—Increased vocal fremitus entire right, anteriorly.

Percussion :—Dulness front and back, and superior axillary region, amounting to flatness over the mammary region.

Auscultation :—Tubal breath right summit, with coarse crepitation, and bronchophonic voice. Diminished vesicular murmur, crepitant rale, and prolonged expiration mammary region.

Gave :—

℞ Acidi nitromuriatici, - - -	gtts. xlviii.
Pepsinæ, (Scaffer's) - - - - -	ʒ i.
Tincturæ nucis vomicæ, - - - - -	f.ʒ i.
Glycerinæ puræ, - - - -	f.ʒ ii.
Aquæ fontanæ, - - - - -	f.℥ viiss.

M. S. A tablespoonful in water before meals.

℞ Quiniæ sulphatis, - - -	grs. xxxii.
Pulveris digitalis, - - - - -	grs. xiv.
Extracti conii solidi, (Merck's) - -	grs. xii.

M. ft. pil. No. xviii. Sig: One after meals.

Afterwards quinine in anti-periodic doses, and combined with tincture of the chloride of iron. Appropriate diet.

August 3. No improvement. Granulated citrate of magnesia in diluted lemonade.

August 6. Seized with intense pleuritic pain right chest, coming on suddenly, and attended with "shock." Decubitus semi-prone; dyspnœa distressing; lips and finger tips cyanosed; great restlessness; appetite paralyzed.

The symptoms suggested perforation of the pleura; but the distress and restlessness were so great that satisfactory physical examination of the chest was prohibited. The pulse was 140 and small.

Hot milk and brandy punches, and external dry heat, failed to mitigate the symptoms. Death occurred on August 8. No *post mortem*.

Case XXIV. July 24, 1875.

Phthisis Pulmonalis of two and a half years' duration; Laryngeal Complication.—Death.

J. A. C——, age 34. Railroad ticket agent from Boston, Mass; arrived in Denver a few days since. Parents living, and in good health; the mother has lost brothers and sisters of consumption.

The patient is tall, slim, and light complexioned; has deep temporal fossæ; has been dyspeptic for years, suffering much of the time from acidity of the stomach, and consequent pyrosis.

Has been coughing for two years; had first attack of pneumorrhagia in May, 1873, and a second attack one year later; pulse 90.

The voice is husky indicative of a tendency to laryngeal complication.

Inspection :—Reveals a long, wide, but flat chest, with defective superior costal movement, right.

Palpation :—Nothing worthy of note.

Percussion :—Dulness front and back, right summit; ditto mammary and inter-scapular regions. Infra-scapular and inferior axillary regions, normal.

Auscultation :—Cavernous respiration and voice, right infra-clavicular region.

It was especially noted that expiration in this region was unusually prolonged and low-pitched. Bronchial respiration, rather feeble, and bronchophony, with distant sub-crepitant rales, along line of junction of infra-clavicular and mammary regions, merging into deficient respiratory sounds of every description over lower portion of mammary and infra-mammary regions, where, on deep inspiration or forced cough, subdued crepitation was heard.

Bronchial respiration and bronchophonic voice, supra-spinatus and inter-scapular regions, and to less extent, infra-spinatus region. Infra-scapular region, normal; ditto, entire left.

October 23. Has spent most of the past two and a half months on a ranche, thirty miles down the Platte from Denver; has indulged in daily exercise on horse. The appetite is fair when in the country and horseback exercise is kept up. The latter also obviates constipation, which is very obstinate at times.

The treatment during the sojourn in the country has been mainly directed with a view of corroborating the digestive and assimilative functions. To this end, mineral acids, pepsin, lactopeptine, quinine in small doses, tincture of nux vomica, salicine, and tincture of cascarilla, have been employed from time to time, as occasion indicated, with counter-irritation to the chest.

It was observed that Mr. C—— never ate or slept so well when he came to town to spend a few days.

Physical examination revealed no very decided change, except less dulness over the right inter-scapular region; the hoarseness has increased.

Ordered nitromuriatic acid and tincture of nux vomica before meals, and cod liver oil emulsion after breakfast and dinner.

The latter agreed with the stomach for a short period, and the strength and appetite seemed to improve during its agreement.

Dec. 26. Aphonia, harrassing cough, pulse 120 in the afternoon; there is a sensation as if a foreign body were lodged in the trachea an inch below the *pomum Adami*; the cough comes on in paroxysms, and is of laryngeal quality; the expectoration profuse and yellow. Laryngoscopic examination reveals a swollen and intensely congested epiglottis, great engorgement of the ary-epiglottic folds, and a degree of tumescence of the superior vocal cords which interferes with a good view of the inferior cords. Applications after Dr. Marcet's formula, of tincture of iodine, iodide of potassium and olive oil, were made to the inside of the larynx three times a week for the succeeding ten days, along with daily sprayings of a mixture containing Kennedy's pinus canadensis, fluid extract conium, aqueous extract opium and glycerine.

Vapor inhalations containing opium, conium, hyoscyamus, were also tried; also, tar.

The constitutional treatment was conducted on general principles as hitherto.

Jan. 11, 1876. No improvement; pulse 120; looks haggard; appetite poor, and strength failing. Advised him to return home to his friends. The advice had a perturbing effect, and elicited a remonstrance to the effect that he must begin to earn something—had been idle long enough—must go to Trinidad or Cañon City in a few days and seek employment; but desired a little treatment to arrest chills which had come in the afternoon for several days past.

The treatment for the latter symptom not proving satisfactory, he started on his return to Boston on the 20th to 24th of January, and died, as I afterward learned from a passenger conductor on the Kansas Pacific Railroad, at Kansas City. I did not see him after the 17th of January, at which time he called at my office to settle his account.

I omitted to mention, that after the cessation of the use of the emulsion of cod oil, the freshly drawn blood of the ox was resorted to and kept up for nearly a month, with the effect of relieving the sense of profound exhaustion of which the patient complained.

CASE XXV. AUGUST 8, 1875.

Threatened Phthisis; Recovery.

J—— E——, aged 26, male; ranchman; has been in Colorado nearly two years; general health improved after coming here from Wisconsin, his native state; is low in stature and compactly built; somewhat sallow; moderate depth of temporal fossæ.

Parents living; mother healthy; father has "liver complaint." A sister has frail health. A brother died of pulmonary consumption, at the age of 21 years. Grandfather on the paternal side died of what is supposed to have been consumption of the lungs.

Our patient has had deteriorated health for seven years. Spat an ounce of blood in the fall of 1872. Believes it came from the lungs.

Has coughed up small quantities of blood since, on several occasions.

Inspection :—Normal.
Palpation :—Ditto.
Percussion :—Ditto.
Auscultation :—Ditto.

January 20, 1876. In fair health and no trouble with the lungs. Has occasional attacks of "*embarrass gastrique.*"

Case XXVI. August 31, 1875.

Laryngeal Phthisis; Marked Emaciation.

J. H. P——, aged 36, male; father died of hernia; mother of algid fever, at 50. A sister died of consumption, at 29, and a brother of chronic diarrhœa at the age of 32.

Our patient has never had hemoptysis, but has had severe cough for three years; is much emaciated and debilitated; appetite impaired, sleep broken, night sweats, aphonia. Has dark hair and complexion and deep temporal fossæ. Has been in Colorado but a few days, and does not feel so well as in Illinois, from whence he came; pulse 120.

Inspection:—Nothing worthy of note.

Palpation:—Ditto, on account of the condition of the voice, if for no other reason.

Percussion:—Vesiculo-tympanitic note on percussion, entire front, right and left; dulness right supra- and infra-spinatus regions.

Auscultation:—High-pitched tubal breath, right and left, summit, front. Wavy inspiration right mammary region; rude respiration left ditto, with sibilant and distant sub-cripitant rales.

Bronchial respiration and sub-crepitus right supra- and infra-spinatus regions, below which, respiration normal on both sides.

Laryngoscopic examination revealed decided hyperæmia of the lining of the superior aperture of the larynx, and ulceration and thickening of the right true cord. No syphilitic contamination observable. Advised the patient to return to his home in the east. Have not since heard from him.

Case XXVII. August 11, 1875.

Phthisis; Aortic Obstructive and Regurgitant Lesion; Pulmonary Hemorrhage; Return to the States.

Miss McG——, aged 26, no predisposition from hereditary transmission. Had an attack of inflammatory rheumatism five years since last autumn, and has had cough for nearly a year. Has marked dyspnœa on exertion, and fever in the afternoons; hot palms and soles; pulse 110. Catamenia about normal. Spat blood to the extent of one-fourth pint last May; œdema of feet.

Inspection:—Diminished costal movement left summit.

Percussion:—Dulness left supra- and infra-clavicular regions, cracked-pipkin resonance near sternum over third cartilage. Dulness left supra-spinatus and interscapular regions.

Auscultation:—Coarse, commingled with finer, rales, below left clavicle, as well as posteriorly over the regions corresponding to dulness. Exaggerated vocal resonance, bordering on pectoriloquy, ditto.

Loud blowing sound accompanying and following the first sound of the heart with area of greatest intensity in third interspace near sternum on right, propagated into the carotids. A blowing sound accompanying and following the second sound of the heart, with area of greatest intensity somewhat below the base of the organ, over the sternum, and propagated downwards towards the left edge of the ensiform cartilage. Pulmonic second sound obscured by the blowing diastolic sound just alluded to, though still distinguishable by placing the Camman stethoscope an inch to left of sternum in third interspace.

The examination was made with a view of deciding upon the propriety of the patient's proceeding to Georgetown to remain with a brother residing at the latter place. It was feared by the friends of the young lady that the altitude of her proposed future home—something over eight thousand feet above sea level—would not fulfill the best requirements of her case.

The results of the examination were adverse to suggesting Georgetown as a future residence, and the opinion was frankly expressed that she would do quite as well, or better, in the dry and somewhat elevated regions of Western Kansas, from whence she came, as in Denver.

August 27th. Despite the advice interdicting even a visit to Georgetown, the patient proceeded to that elevated region the next day after the examination; was seized a day or two thereafter with profuse hemoptysis which greatly distressed her. She also suffered a decided aggravation of dyspnœa. The hemorrhage ceasing, returned to this city to-day, and spat blood freely soon after her arrival. Pulse 120 and of considerable fullness, with heat of surface and thirst.

Ordered:—
℞ Extracti ergotæ fluidi (Squibb's) - - - f.℥ i.
Extracti cimicifugæ fluidi - - - - ℥ ss.
M. Sig: Thirty drops every four hours.
℞ Liqoris ferri pernitratis. - - - - f.℥ i.
Sig: Fifteen drops every six hours in water.

August 28th. Still expectorates blood, though it is dark and clotted, and evidently extravasated some hours since.

Pulse 110; appears less perturbed, generally, than yesterday.

Will start to Western Kansas the day after to-morrow. Have not since heard from the case.

CASE XXVIII. AUGUST 13, 1875.

Mr. D. J. M——, aged 30. Parents dead; father at 62, of injury; mother at 56, cause unknown.

Has two brothers and one sister living in good health; the brothers aged respectively, 26 and 37 years—the sister, 33. One sister died at the age of 12, cause unknown.

Mr. M—— has brown hair, dark complexion, and deep temporal fossæ. Has had ill health for five years, commencing in debility and dyspepsia.

Has been in Colorado about two years, and is possessed of an impression that his health is better here than in the states. Has had cough for four and a half years, and hemoptysis, amounting to a half pint, in Feb. 1871; has had several similar attacks since then, raising inconsiderable quantities of blood.

In April, 1874, experienced tenderness, which issued in swelling, over the left sixth and seventh ribs, on a line with the nipple, and which now receding, now reappearing, resulted in abscess pointing externally in the situation described.

Dr. W. H. Thacker, of this city, through whose courtesy I was permitted to examine the case, opened the abscess on June 23, 1874, a half pint of pus escaping at the time.

Air issued—or bubbles of gas—from the cavity of the abscess, but with which of the respiratory acts is not certain. Nor is it established whether the gas first obtained entrance from without, and issued from the chest with the movements of respiration, or whether its source was the lung. At any rate, no bubbles of gas escape at this time, though a sinus communicates with a focus within, from which more or less pus issues daily.

Inspection:—Infra-clavicular flattening right and left; defective costal movement left, superiorly, most apparent on forced inspiration.

Palpation:—Nothing worthy of note.

Percussion:—Dulness of tympanitic quality entire front, approaching ordinary dulness above left clavicle, though decidedly tympanitic from third rib to base.

Dulness posteriorly, right and left, most apparent over right supra- and infra-spinatus regions.

Auscultation:—Harsh bronchial respiration and coarse crepitation left infra-clavicular region; cavernous (?) respiration left mammary, near sternum.

Tubal breath posteriorly to near lower angle of scapula.

Supplemental respiration right supra-spinatus and infra-clavicular regions,

Broncho-vesicular respiration right mammary, infra-mammary, and infra-scapular regions; more or less sub-crepitant rale over middle and lower portions of chest, posteriorly, extending lower on left than right.

Vocal resonance left front increased, apex beat of heart between the sixth and seventh ribs nearer left margin of sternum than nipple line.

The rate of pulse at this examination was lost.

A prescription was given to improve the appetite, which was very much below par.

February 13, 1876. Have not made a physical examination of chest since date of first report, but have seen the party frequently, and had conversations with him relative to the condition of his health.

He rides much of his time on horse, frequently going to the country and remaining indefinitely, pursuing this mode of exercise.

His appetite flags occasionally, requiring the use of tonics and mineral acids.

For the purpose of improving the appetite and invigorating digestion, he states he usually resorts to the prescription given on August 13, which was as follows:—

℞ Acidi nitromuriatici,	gtts. xlviii.
Pepsinæ, (Scaffer's),	ʒ i.
Tincturæ nucis vomicæ,	f.ʒ i.
Aquæ fontanæ,	f.℥ viiss.

M. Sig: A tablespoonful in a wine-glass of water before meals.

Sometime last winter he informed me that small pieces of bone had discharged through the sinus in the wall of the chest—evidently portions of necrosed rib.

Has "held his own" pretty well during the winter; coughs and expectorates about as usual.

Case XXIX. August 24, 1875.

Pulmonary Tuberculosis following Pneumonia; Death in about One Year.

Miss K. B——, aged 20; a young woman of fine accomplishments who has been educated at the cost of her health. Parents dead: father of inflammation of "stomach and bowels" at 58; mother at 36 of "lung trouble."

Has a sister aged 16 in good health; one sister died in baby-hood, and a brother, aged 3 years, of croup.

Last February contracted a severe "cold," which resulted in pneumonitis affecting the right lung, as was stated by her uncle, a physician who accompanied her to this city. She has deep temporal fossæ; highly sensitive nervous system; insomnia; night sweats; hot skin; daily "chills," followed with evening exacerbations of fever. The pulse is 120, and there are thin brownish crusts on the lips. The appetite is impaired, and she has recently had diarrhœa. Has lost in weight, but does not know how much. Spat blood, but not profusely, a few weeks since; marked dyspnœa. Arrived here seven weeks since. For a time gained in appetite, weight and strength; but has since declined in every respect.

Inspection :—Respiration hurried.

Palpation :—Nothing worthy of note.

Percussion :—High-pitched tympanitic note above and below left clavicle, and indeed, the percussion note over the entire chest, front, partakes of this quality or merges into vesiculo-tympanitic resonance.

Dulness right supra-spinatus region.

Auscultation :—Broncho-vesicular respiration left infra-clavicular region; tubal respiration right supra-spinatus, and wavy inspiration right infra-mammary region.

The constitutional malady seemed to be in advance of well marked local lesion.

Notwithstanding very attentive physical examination, and fully aware of the apparent incongruity in associating "tympanitic resonance" with "broncho-vesicular respiration," nevertheless such was the case, and a second careful exploration of the chest not only confirmed the results of the previous investigation, but failed to give evidence of the existence of extensive localized deposit or consolidation, and hence the lungs were supposed to be the seat of miliary tubercle.

The young lady being desirous of returning to her friends in Missouri, herself realizing that she was not improving in health here, and convinced myself that her case belonged to a type of the disease not benefitted, if not injured, by residence here, I consented to a return.

She died May 28, 1876, at Sedalia, Missouri.

CASE XXX. SEPTEMBER 10, 1875.

Phthisis Pulmonalis; Larynx Involved; Death in Twenty Months.

A. P——, cabinet maker; parents dead: cause unknown; came to Colorado less than a year since and engaged in his vocation, but complained that the dust of the manufactory irritated his lungs and throat. One of his brothers died of pulmonary consumption.

There is marked hoarseness not infrequently merging into aphonia; intense pharyngitis granulosa, attended with inordinate secretion, profuse salivation, and great difficulty of deglutition. Looks anxious and hollow; lips slightly cyanosed; dyspnœa marked. Has coughed for about 18 months. Pulse ranges from 110 to 120 afternoons, sitting; evening exacerbations of fever, night sweats, and insomnia. There is marked constipation. Never spat blood.

Inspection :—Reveals a scrawny chest, defective in antero-posterior diameter.

Palpation :—Yielded negative results, on account of the condition of the larynx.

Percussion :—Dulness right and left, summit, front and back.

Vesiculo-tympanitic resonance right base front and back.

Auscultation:—Bronchial respiration right infra-clavicular, supra-spinatus and inter-scapular regions, with pleuritic creaking and sub-crepitus in the former region, associated with wavy inspiration terminating in distant "mucus click."

Supplemental respiration base, front and back. Cavernous respiration left infra-clavicular and supra-spinatus regions with coarse, moist rales in former.

Bronchial respiration and sub-crepitant rales left mammary, and to less extent, infra-spinatus region.

Up to October 6, the leading symptoms remained unchanged. There were well marked evening exacerbations of fever, increasing hoarseness, loss of appetite, distressing dysphagia.

Oct. 6. Marked chill followed with intense fever, great dyspnœa, insomnia, ending rapidly in exhaustion.

Oct. 7. No improvement; lips and finger nails livid; dyspnœa extreme.

Oct. 8. Died.

CASE XXXI. SEPTEMBER 15, 1875.

Phthisis Pulmonalis, extending beyond the ordinary duration.

M. M——, aged 31, turner; has been in Colorado six months; no hereditary tendency. Has had cough for three years, and hemoptysis half a dozen times, the first attack occurring over two years since and amounting to several ounces. Pulse 110; coughs and expectorates principally in the morning, shortly after rising; has pretty well marked evening exacerbations of fever.

Figure somewhat stooped, medium stature, medium depth of temporal fossæ.

Inspection:—Diminished costal movement left infra-clavicular region.

Palpation:—Increased vocal fremitus, ditto.

Percussion:—Raised pitch of percussion note over inner end of left clavicle, supra- and infra-clavicular and mammary regions; dulness left supra- and infra-spinatus regions.

Right normal.

Auscultation:—Weakened respiratory murmur left infra-clavicular, mammary, and infra-mammary regions and sub-crepitant rales over corresponding areas.

Ditto posteriorly to lower angle of scapula.

Right normal.

Treatment:—Mineral acids, pepsin, muriated tincture of iron and quinine, with an occasional course of cod liver oil, as occasion required. Wintered at Arapahoe County Hospital.

April 15th, 1876. Nitromuriatic acid with pepsin before meals; Moller's cod liver oil on whisky after breakfast and dinner.

May 9th, 1876. Pulse 100; appetite fair; sleeps well; coughs principally after rising in the morning; expectorates from two to four ounces of yellow heavy sputum daily.

Inspection:—Diminished costal movement and depression left infra-clavicular region.

Palpation:—Increased vocal fremitus, ditto.

Percussion:—Diminished resonance of tympanitic quality left supra-clavicular, infra-clavicular, mammary and scapular regions.

Auscultation:—Defective breath sounds and coarse croaky rales intermingled with moister large rales, left summit, front and back; a very peculiar, croaky rale heard near the ear over infra-spinatus region. Greatly exaggerated vocal and whispered resonance, near the ear, over the above areas. Elsewhere left, diminished breath sounds and sub-crepitant rales commingled with rhoncus.

Right, supplemental respiration.

Ordered:

℞ Tincturæ ferri chloridi,	f.ʒ vi.
Hall's solut. strychniæ,	f.℥ ss.
Quiniæ sulphatis,	grs. xxxii.
Aquæ fontanæ,	ʒ xxii.

M. S. A teaspoonful in a wineglass of water before meals.
Moller's oil on whisky after breakfast and dinner.

CASE XXXII. SEPTEMBER 30, 1876.

Phthisis Pulmonalis complicated with Laryngeal Affection.

W. A. G——, aged 38; printer; dark hair and hazel eyes, dark complexion; deep temporal fossæ.

Father died of rheumatism aged 68, and had been asthmatic for years previous to his death. Mother died at 55, after an injury. One brother died of "fever" at 48, and a sister of pneumonia at 25. Has four sisters and two brothers living, in good health with the exception of one sister, who has had cough for forty years.

Our patient has been in Colorado for fourteen months; has had cough for two years; hoarseness has existed for eighteen months. Spat blood one year ago after blowing a brass horn.

Inspection:—Nothing worthy of note.

Palpation:—Exaggerated vocal fremitus over both infra-clavicular regions, most decided right.

Percussion:—Diminished resonance and raised pitch, right and left supra-clavicular regions; ditto, quite decided over the clavicles, most marked, right.

Vesiculo-tympanitic resonance right mammary and infra-mammary regions; most decided over the former.

Flatness right supra-spinatus region.

Diminished resonance below spine of right scapula.

Auscultation:—Bronchial respiration, bronchophonic voice of painful intensity, with coarse mucus rales on inspiration, and exaggerated heart sounds, right infra-clavicular region.

Diminished vesicular respiration and sub-crepitant rales mammary and infra-mammary regions.

Bronchial respiration, distant coarse crepitation, right supra-spinatus region; diminished vesicular respiration below spine of scapula.

Weakened inspiratory murmur and "mucus click" at end of inspiratory act, left infra-clavicular region, with sub-crepitant rales, near sternal end of clavicle.

"Mucus click" along upper boundary of mammary region.

Sub-crepitant rales left supra-spinatus region.

April 28, 1876. Had intolerable cough, and heavy expectoration all winter; occasionally diarrhœa, and frequently, night-sweats; marked dyspnœa. Has evidently "lost ground."

Will go to country in a few days to get the benefits of country air and enjoy a season of angling.

Is somewhat averse to physical examination of the chest, claiming that his ailment is principally laryngeal and bronchial.

CASE XXXIII. SEPTEMBER 30, 1875.

Rapid Phthisis; Death in Nine Months.

J. H——, aged 28, male; just arrived from Texas. Parents living. Father healthy; mother phthisical.

Our patient is severely emaciated, has high fever, loss of appetite and insomnia; pulse 120.

Has had cough since last January; never spat blood; dyspnœa is marked on exertion.

Inspection:—Right chest largest; diminished costal movement left infra-clavicular region.

Palpation:—Exaggerated vocal fremitus left infra-clavicular, mammary and axillary regions.

Percussion:—Vesiculo-tympanitic resonance right summit, front. Raised pitch, left clavicular and supra-clavicular regions; dulness mammary, axillary and inferior axillary regions; ditto supra-spinatus region.

Auscultation:—Tubal breath, commingled sub-crepitus and coarse moist rales, entire left, except posteriorly at base, with bronchophonic voice and whisper.

October 9. No improvement. The cough, chills, fever, loss of appetite and accelerated pulse continue.

October 10. Siezed last night with intense pleuritic pain in left side, followed with orthopnœa, jactitation, and accelerated pulse; the latter running up to 136.

October 11. Died.

No improvement from change of climate.

CASE XXXIV. OCTOBER 20, 1875.

Phthisis; Large Cavity; Death in Four Years from Hemoptysis.

Mrs. J. B. W——, aged 46; arrived six weeks since from Greenville, Illinois.

Commenced coughing in May, 1872.

The cough was ushered in with pharyngitis and hoarseness; has at times had aphonia, and at this time the cough and voice are hoarse.

Father died at the age of 59 of typhoid fever; mother in her 74th year, of paralysis. The parents had eleven children, of whom two of the brothers died of phthisis, aged respectively, 27 and 52. Lost three sisters of the same disease, aged respectively, 30, 40 and 45.

Our patient has not had hemoptysis; is tall and shaddowy, with deep temporal fossæ, and decidedly anæmic; coughs hard and expectorates, rather profusely, a thick, yellow matter.

Inspection:—Diminished superior costal movement, left.

Palpation:—Nothing worthy of note.

Percussion:—Dulness, left summit, front and back, extending posteriorly to lower angle of scapula, and anteriorly to third interspace. Decided *crack pôt* resonance left infra-clavicular region. Vesiculo-tympanitic resonance right supra-clavicular and infra-scapular regions. Dulness over the scapula above and below spine, right.

Auscultation:—Bronchial respiration right summit, front, to second rib, below which, increasing to lower border of lung, weakened and deferred inspiration, with low-pitched, prolonged expiration. (Emphysema?)

Bronchial respiration to lower angle of scapula, and bronchophonic voice, with sub-crepitant rales. Deferred inspiration over lower angle of scapula and infra-scapular region, with low-pitched, prolonged expiration, and sonorous rales.

Cavernous respiration, voice and whisper, with croaky and sonorous rales, infra-clavicular, supra-spinatus, and infra-spinatus regions, left. Elsewhere left, defective breath sounds, coarse and fine rales commingled.

At this time there is slight daily chill and afternoon fever; the pulse is 90 in forenoon, and 120 in afternoon. There is possibly a malarial element in the case, as she hails from a malarious region. At any rate the symptoms yielded to quinine in anti-periodic doses, and nitromuriatic acid. The pulse was still farther equalized on quinine, digitalis and extract of conium.

February 16, 1876. Has kept up pretty well thus far during the winter until within the past few days. Has slept with a free admission of air from the outside to her chamber during the entire fall and winter; and is compelled to do so on account of the dyspnœa that ensues when an attempt is made to sleep in a closed room. The coldest nights of the winter offered no exception to the rule.

During the past few days, has had well marked daily chills, followed with high fever and night sweats; the cough and hoarseness are aggravated. Extra doses of quinine during the intermission of the fever, minute doses of Fowler's solution after meals, and a cough mixture containing chlorodyne and syrup of tolu, controlled the symptoms to a considerable extent.

Becoming convinced that her days were nearly numbered, she left for her old home in Illinois, about March 1.

May 17. Have this day received a letter from her husband informing me of the death of his wife, which occurred on the evening of April 15, ult. Death was caused by sudden and overwhelming hemorrhage from the lungs, producing suffocation in less than five minutes after its supervention.

Mrs. W. improved in general health for a time after she arrived here, and again, for several weeks during the later fall, and earlier winter, months.

Case XXXV. October 23, 1875.

Rapid Phthisis; Cavity; Death in Eleven Months.

J—— P——, male; occupation, laborer; aged 27. Mother living, healthy, aged 45; father dead, age and cause unknown. Five brothers living; oldest 17 years, youngest 5 years. Came to the Territory in July, ult. Has had cough since the last of December, 1874; has deep temporal fossæ; is lean and debilitated; pulse 120 in the afternoon.

Spat pinkish colored sputa about three weeks since; had night sweats frequently during the summer, and recently, marked dyspnœa. Cough is quite frequent now, and the expectoration tough and albuminous.

Has diarrhœa, and suffered from a similar attack of ten days duration last August. Is twenty pounds lighter than his average weight.

Inspection:—Defective costal movement right anterior, and decided flattening in the mammary region.

Palpation:—Increased vocal fremitus right infra-clavicular region.

Percussion:—Dulness right infra-clavicular, infra-spinatus, and left supra-spinatus regions. Tympanitic resonance right mammary and supra-spinatus regions; *crack pôt* resonance over first interspace, near sternum.

Irregularly raised pitch of percussion note, giving place in areas to normal resonance, left anterior.

Auscultation:—Cavernous respiration, voice and whisper, infra-clavicular and mammary regions, right. Interrupted inspiration, short and ineffectual, with prolonged expiration, left anterior.

Cavernous respiration right supra-spinatus region. Tubular breath and sub-crepitant rales left supra-spinatus region.

Exaggerated respiration at both bases, posteriorly.

Without the least amelioration in any respect, but with a pernicious progressive *tendency* from day to day, death took place on November *13, at the* Arapahoe County Hospital.

CASE XXXVI. OCTOBER 23, 1875.

Rapid Phthisis after Childbirth; Cavity; Death in Eight Months.

Mrs. C. C. B——, aged 26 years this day. Black hair and eyes, dark complexioned; deep temporal fossæ. Parents died of pulmonary consumption; father at the age of 40, and the mother in her 35th year.

Our patient has marked dyspnœa, is extremely debilitated; pulse 130 in afternoon.

Has fever and night sweats; has lost twenty pounds since March 1, ult.

Was confined 7th of February, ult., of a male child who died a few months afterwards. Had a slight attack of hemoptysis in the fall of 1870. Contracted cough 1st of March, ult.

Inspection:—Body so emaciated the bony thorax appears to be hidden from view by a mere covering of integument. *Costal expansion on forced inspiration good.*

Percussion:—Vesiculo-tympanitic resonance above right clavicle; dulness over and below ditto to second rib; from second rib to fifth interspace, tympanitic resonance, shading into marked dulness over infra-mammary region.

Vesiculo-tympanitic resonance supra-spinatus, tympanitic resonance from spine of scapula to lower angle of ditto, as well as inter-scapular region, right; dulness infra-scapular region, right. Resonance intensified anteriorly, left. Dulness supra spinatus and infra-spinatus regions, ditto; elsewhere, posteriorly, left, presenting the type of exaggerated pulmonary resonance, without material alteration of pitch.

Auscultation:—Broncho-vesicular respiration right summit.

Cavernous respiration of great distinctness, cavernous voice and whisper, with gurgling, infra-clavicular (lower portion), and mammary regions, also from spine of scapula to lower angle, right. Tubal respiration over lower portion of mammary and infra-mammary regions, right. Supplemental respiration, with occasional sub-crepitant rales, left front. Tubal breath and sub-crepitant rales supra-spinatus and infra-spinatus regions, left.

This examination was sought by the husband solely to determine the length of time the wife would probably survive.

If die soon she must, it was the expressed desire of both to be made cognizant of the fact, as the wife, in the latter event, wished to return to her home and friends in Ohio. The prognosis given to the husband was, that his wife could live but a short time at farthest, and the opinion was expressed that she could reach home alive by starting at once and journeying as her strength would permit. The homeward journey was undertaken two days subsequently, and Central Illinois was reached without undue fatigue. But here a stop of a few days with acquaintances was determined upon. After two or three days, however, alarming symptoms of prostration and great dyspnœa supervened, and death shortly thereafter ensued.

In a letter received from the husband informing me of the decease of his wife, the opinion was expressed that the latter could have reached home without particular inconvenience, had the journey been more continuously prosecuted—a well-deserved tribute to the conveniences and comfort of modern methods of travel.

CASE XXXVII. OCTOBER 19, 1875.

Phthisis Pulmonalis; Laryngeal Complication; Improvement from Winter Residence in Southern California.

Col. W. F. P——. (Examination and treatment in conjunction with Dr. Wm. H. Williams of this city.) Aged 36; manufacturer. Parents *living and in good* health.

Have since been informed by Dr. Archer of West Meriden, Conn., that the mother "was formerly strumous."

The Colonel contracted a "cold" in Chicago last winter, had aphonia for some time thereafter; regained the use of the voice, though still hoarse. Has had troublesome cough since the winter; tendency to constipation, and night sweats at intervals.

Pulse ranges from 96 to 110, sitting, in the afternoons.

Has not lost much in weight, and though of fine textural organization, is well muscled; moderate depth of temporal fossæ.

Inspection:—Left chest largest, and flatter, especially in infra-clavicular and mammary regions, probably mainly due to asymmetry.

Diminished costal movement right infra-clavicular and mammary regions.

Palpation:—Exaggerated vocal fremitus right summit, front and back.

Percussion:—A noticeable feature in the percussive phenomena of this chest is *universal moderate resonance.*

Supra- and infra-clavicular regions, right, raised pitch of percussion note of tympanitic quality.

Moderate resonance mammary and infra mammary regions without appreciable deviation from normal pitch.

Dulness supra- and infra-spinatus, and superior axillary regions.

Left, moderate resonance, probably normal.

Auscultation:—It is observed of the auscultatory phenomena whether normal, or abnormal, that the sounds are comparatively *feeble.*

Diminished respiratory murmur supra- and infra-clavicular regions, right, with distant, subdued, small crepitation, and leathery, creaky *bruit;* vocal and whisper resonance exaggerated.

Feeble vesicular murmur mammary and infra-mammary regions.

Bronchial respiration, sub-crepitant rales, exaggerated vocal and whispered resonance, supraspinatus and inter-scapular regions, right.

Tubular breath, distant small rales, and leathery *bruit* superior axillary region, same side.

Feeble, but probably normal, vesicular murmur base, posteriorly; ditto left chest, each region presenting those peculiarities usually found in health.

Mucus "click" with both respiratory acts over box of larynx; marked hoarseness.

October 20. Laryngoscopic examination: Epiglottis red and thickened; hyperæmia of the ary-epiglottic folds and mucus covering of the arytenoid cartilages; tumescence and engorgement of the superior cords which overlap the true cords except during pronounced effort at phonation.

On phonating the note "ah" vigorously, the "vocal laminæ" appear momentarily, and though the view is somewhat unsatisfactory, they appear normal.

November 2. Incredible irritability of the nervous system, insomnia, bloody expectoration. Physical signs much the same.

November 10. No change.

November 11. Had local attack of pneumonitis confined to apex of right lung, as I am informed by Dr. Williams.

November 20. Out again.

Dr. W. and myself had previously concurred in advising the Colonel to winter in Southern California, believing the climatic conditions of the latter region better adapted to the laryngeal and nervous elements in the case than the winter climate of Colorado. Accordingly, he went to California about November 30.

May 8, 1876. Returned to Denver a few days since after wintering in Southern California.

After reaching his destination had, as Dr. Archer who accompanied him as medical attendant, states, an attack of pneumonitis confined to the upper and middle lobes of the right lung, bloody expectoration, amounting at times to hemoptysis, and intense naso-pharyngeal catarrh; this train of troubles continuing nearly a month.

At the end of a month's residence at Santa Barbara began to improve; bloody expectoration disappeared; commenced a system of exercise out door on foot and horse, and materially improved; the signs of the local pneumonitis cleared up to a considerable extent; the appetite improved, sleep was refreshing, and a fine flow of spirits returned.

Last of March, wishing to return to San Francisco or vicinity, and determined to avoid a sea voyage to the latter place, it was decided to take the stage to the nearest point on the railroad leading to Oakland, Cal. The stage ride involved crossing the San Fernando range of mountains into the San Fransquito Cañon beyond, up the latter twenty miles, crossing the stream of the same name over one hundred times in the distance of twenty miles; thence over the San Fransquito and Oak Creek ranges of mountains: the former range having an altitude of six thousand to seven thousand feet, and at the time covered with snow. The road up the San Fransquito range being very steep in places, and the coach heavily laden, the Colonel with other passengers alighted at steep places, and in several instances pursued the ascent on foot for half a mile, feeling no inconvenience at the time from the excitement incident to the mountainous journey or unusual exertion experienced in clambering the steeps.

Reaching Oakland March 25, hoarseness and cough to moderate extent had returned. Two weeks afterwards, and while in a stooping posture blowing into the base of a stove with the intent of exciting a waning fire into activity, in obedience to a sudden impulse to cough, he brought up a mouthful of blood.

Again, on April 25, while laughing heartily, he was attacked with hemoptysis which continued until the 30th of same month. Arrived here May 2. On the 6th another slight hemorrhage, lasting 48 hours.

May 7. Inspection:—Diminished costal movement right infra-clavicular and mammary regions; flattening of chest wall, ditto, to limited extent.

Palpation:—Exaggerated vocal fremitus over scapula and infra-clavicular region, right.

Percussion:—Dulness right summit, front and back, inter-scapular and superior axillary regions. Left normal.

Auscultation:—Bronchial respiration supra-clavicular and infra-clavicular regions, right, with sub-crepitant rales, bronchophonic voice and whisper; diminished vesicular respiration, right mammary and axillary regions. Sub-crepitant rales, bronchophonic voice, and marked wavy inspiration at junction of mammary with axillary regions.

Weak tubular respiration supra-spinatus. infra-spinatus and inter-scapular regions, with fine crepitation, and bronchophonic voice. Exaggerated heart sounds infra-clavicular and inter-scapular regions, right. Has had decided hoarseness since reaching Oakland, California, the last of March.

May 9. Started to Connecticut this morning.

CASE XXXVIII. DECEMBER 10, 1875.

Phthisis Pulmonalis; Second Stage; No Improvement Resulting from Change of Climate.

T. H. A——, aged 24, farmer; low in stature; light hair, hazel eyes; *medium depth of temporal* fossæ.

Father living, aged 56, health good; mother died in childbirth, aged 30.

Mr. A—— weighs 140 pounds; has lost 20 pounds in the last year; looks tender and succulent.

Has had severe cough for about one year; spat blood in small quantities last winter; has constant dyspnœa, fever, and is troubled with insomnia.

Pulse 140. Temperature (3 p. m.) 104.°

Appetite execrable; vomits food occasionally in connection with paroxysms of cough.

Inspection:—Diminished costal movement left infra-clavicular region.

Palpation:—Exaggerated vocal fremitus ditto, and over superior portion mammary region.

Percussion:—Dulness above, over, and below clavicle, left; ditto superior axillary region. Cracked pipkin resonance over third rib; tympanitic note posteriorly. Slightly raised pitch of percussion note over superior portion of mammary region, right.

Auscultation:—Tubal breath, (deferred and prolonged expiration) left infra-clavicular, mammary, and superior axillary regions. Inspiration "jerking."

Supplemental respiration posteriorly below angle of scapula; "cog-wheel inspiration" over scapula.

Distant crepitus outer boundary mammary, right, and feeble breath sounds posteriorly, ditto.

January 8. Has not taken treatment during the two weeks past—concluded to trust to the curative influences of the climate. Pulse 136. Temperature 103.6° 3 p. m.

Great dyspnœa, insomnia, loss of appetite, night sweats; urine loaded with urates; is constipated; has daily chills followed with intense fever; coughs almost constantly at night; feet œdematous.

Ordered:

℞ Acidi nitromuriatici,	gtts. xlviii.
Pepsinæ,	ʒ i.
Aquæ fontanæ,	f.℥ viii.

M. Sig: One tablespoonful in a wine glass of water before meals.

℞ Quiniæ sulphatis,	grs. xxiv.
Pulveris digitalis,	grs. xviii.
Extracti conii solidi, Extracti hyoscyami solidi,	ââ grs, viii.

M. Ft. pil, No. xviii, Sig:—One after meals.

℞ One bottle Bishop's granulated citrate of magnesia.

Sig: A teaspoonful in weak lemonade four or five times daily.

℞ Potassii bromidi,	℥ ss.
Chloral hydratis,	℈ iv.
Aquæ destillatæ,	f.℥ v.
Tincturæ cardamomi compositæ,	f.℥ ss.
Syrupi tolutanus,	f.℥ iiss.

M. Sig: A tablespoonful in water at bedtime, to be repeated in one hour if not disposed to sleep.

January 13. Physical signs much the same; less fever; pulse 128, temperature 102.5° 3 p. m.; sleeps much better; urine paler; bowels soluble.

Advised him to return home, which advice was promptly acted upon, as the altitude aggravated his dyspnœa, and the dry, electric air rasped his nervous system.

Have information from the case to June 5. Is losing ground—scarcely *able to leave his room.* His friends think he cannot survive much longer.

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CASE XXXIX. DECEMBER 13, 1875.

Phthisis Pulmonalis; Cavity; Excessive Hemorrhage.

P. A. S——, aged 35; a patient of Dr. W. H. Williams, through whose kindness I have been permitted to examine and report this case. Occupation, miner. Has resided in Colorado four years.

Is large and well proportioned. Father died at 36, of pleurisy; mother at 36 or 37, cause unknown. Two brothers are dead; one of pulmonary consumption, at the age of 33, the other of gun shot wound. Three sisters living in good health, aged respectively, 45, 33, and 31 years.

Mr. S——, is somewhat addicted to the use of alcohol, and presents indications of premature age. Temporal fossæ shallow; pulse 90; has had cough for five months; spat blood July, ultimo; had a frightful hemorrhage from the lungs last September, threatening the destruction of life, in which more than half a gallon of blood was lost during the attack, which extended over nearly a fortnight. Has had night sweats; no diarrhœa; appetite at this time fair.

Inspection reveals a well formed chest, covered anteriorly with a mat of capillary growth. Diminished costal movement right infra-clavicular and superior portion of mammary regions.

Palpation:—Increased vocal fremitus over lower border of mammary and infra-mammary regions.

Percussion:—Dulness over clavicular region, (slight); dulness infra-clavicular, mammary, axillary, supra-spinatus and inter-scapular regions, right. Left: increased resonance summit, front, and base, back.

Auscultation:—Cavernous respiration, voice and whisper, right infra-clavicular region, and from spine of scapula to lower angle of ditto.

Tubular breath near sternum, on line separating infra-clavicular and mammary regions. Diminished vesicular respiration over middle and lower portion of mammary region, and over infra-mammary region, with exaggerated vocal resonance and occasional sub-crepitant rales; diminished breath sound, tubal in type, and bronchophonic voice, right supra-spinatus region. Loud tubular breath and voice inter-scapular, right.

Tubal breath and friction fremitus, right axillary region.

Supplemental respiration left, most decided over infra-scapular region.

The patient suffered from an attack of pulmonary necrosis during the great hemorrhage in September, and yet occasionally expectorates shreds of necrosed pulmonary tissue, as well as casts of the bronchial tubes.

June 10, 1876. Not much change in general health. Has gone to Georgetown to live. An opportunity to examine the chest presented but the one time.

CASE XL. MARCH 14, 1876.

Phthisis Pulmonalis; Marked Hereditary Tendency.

W. W. W——, aged 36, merchant; large and well formed; temporal fossæ deep; light complexion; weight 169 pounds; has lost 30 pounds since last fall; coughs considerably, complains of impaired appetite, has night sweats occasionally; is slightly hoarse. The cough began last September, since which the health has gradually declined. Pulse 110.

Arrived here about two weeks since; spat some blood shortly after arriving, for the first time in the history of the case.

The father, two brothers, and three sisters have died of phthisis; the former at the age of 50, the sisters, each, about the 25th or 26th years of life, and the brothers, respectively, at 36 and 40.

Inspection:—Flattening and diminished costal expansion right infra-clavicular region.

Palpation:—Increased vocal fremitus, corresponding to area of diminished costal movement.

Percussion:—Dulness infra-clavicular and superior portion of mammary regions, right.

Slight dulness infra-spinatus and inter-scapular regions, right.

Auscultation:—Diminished vesicular respiration, bronchophonic voice and whisper, infra-clavicular right, associated with creaky-new-leather-like sounds, and distant, sub-crepitant rales.

Tubal breath and distant sub-crepitus, supra-spinatus and infra-spinatus regions, right, with exaggerated vocal resonance.

Ordered:

℞ Acidi nitromuriatici, - - - - -	gtts. xlviii.
Pepsinæ, - - - - - - - - - - -	ʒ i.
Tincturæ nucis vomicæ, - - - - - -	f.ʒ i.
Glycerinæ puræ, - - - - - - -	f.ʒ ii.
Aquæ fontanæ, - - - - - - - -	f.℥ viiss.

M. Sig: One tablespoonful before meals in a wine glass of water.

℞ Quiniæ sulphatis, - - - - - -	grs. xxiv.
Pulveris digitalis, - - - - - -	grs. xv.
Extracti conii solidi, - - - - - -	grs. ix.

M. Ft. pil. No. xviii, Sig:—One after meals.

℞ Olei tiglii, - - - - - - - - -	f.ʒ i.
Tincturæ iodinii, - - - - - - -	f.ʒ i.
Olei Olivæ, - - - - - - - -	f.ʒ vi.

M. Sig: Use on chest as directed.

March 28. Appetite and sleep better; pulse 90; no examination of chest. Will return to Illinois in a few days to make arrangements to move to Colorado.

CASE XLI. MAY 20, 1876.

Phthisis Pulmonalis (?) Recovery.

W. K——, aged 36; broker. Father died at 76, of old age; mother living, aged 68, health good. There were thirteen children in the family; seven sisters and six brothers. Three of the sisters are dead—*two* of phthisis pulmonalis, respectively aged 18 and 28 years, and the third of marasmus, aged 3 years. Health of the remaining sisters, all of whom are married, good. *Four* of the brothers died of pulmonary consumption—three between the 18th and 20th years of life, and the fourth in the 32d year.

Mr. K—— has dark hair, gray eyes, and medium depth of temporal fossæ. Experienced an attack of hemoptysis thirteen years since; was directed by his physician to go to Aiken, S. C.; took cod oil and iron; experienced loss of flesh, strength and appetite, and had cough. At the end of two months treatment had regained health to a considerable extent. Changed from a sedentary occupation (silver-plating) to out-door life, (running an express wagon), and his health remained firm for ten years.

Engaged in real-estate and brokerage; soon thereafter his health began to decline; cough returned with loss of flesh and strength; the appetite failed; the expectoration became profuse, and often contained streaks of blood; had fever of evenings.

Came to Colorado Nov. 12, 1874; was twenty-two pounds under average weight when he reached Denver. Began to improve in appetite about one month after arrival, and three months after reaching Denver bought a horse, and commenced a system of exercise on horse.

Has not engaged in business since coming to Denver, but has made it his business to recuperate his health.

Began camping middle of May, 1875, and continued until August 1. Made it a rule to sleep in the open air on a buffalo robe. After returning to this city, in August, would straddle his horse in the evening and ride to the country, from three to six miles, prepare his bed on the dry ground of the treeless plains, enjoy refreshing slumber until morning, and return to town for breakfast. This habit was kept up until October 1. Returned to the state of New York about the 6th of October, ult. and remained two months. Was not so well while east. Remained in this city during the winter after his return from New York; took exercise out door constantly, sleeping in a room with open windows.

At this date feels well—looks well.

Inspection:—Full, pretty well rounded chest, covered with heavy capillary growth; right side along junction of fourth, fifth and sixth ribs with sternum, fuller than corresponding region, left.

Palpation:—Nothing worthy of note.

Percussion:—Vesiculo-tympanitic resonance left supra-clavicular region; slight comparative dulness right supra-spinatus and inter-scapular regions, the difference not being greater than is frequently observed in health.

Auscultation:—Sibilant rhonchus left infra-clavicular region, near sternum; soft, indistinct, blowing sound commencing with the first sound of the heart, most apparent at the end of inspiration and commencement of expiration, not propagated to the arteries in the neck, and heard over the mammary and inferior portion of the infra-clavicular regions, left, with greatest intensity. It was observed that the voice was unusually resonant over every portion of the chest; breath sounds somewhat feeble, though not tubular, right supra- and infra-spinatus regions.

With proper care, Mr. K——bids fair to live many years in this climate which seems well adapted to his requirements.

CASE XLII. MAY 28, 1876.

H. M——, aged 23. Has been in Colorado since 22d February, ultimo. Occupation, machinist. Father died at 49, of pleurisy; mother at 48, of consumption; has had cough since March, 1875; never spat blood; has marked fever, impaired appetite, constant diarrhœa; coughs a great deal; troublesome insomnia; œdema of feet.

Figure: Tall and decidedly emaciated; deep temporal fossæ.

Inspection:—Diminished costal movement infra-clavicular and superior portion of mammary regions, right.

Palpation:—Increased vocal fremitus, ditto.

Percussion:—Dulness right summit, front, to second intercostal space; ditto right infra-spinatus region; vesiculo-tympanitic resonance above spine of scapula, ditto.

Dulness left supra-spinatus region.

Auscultation:—Tubal breath and voice right summit, with coarse crepitation; diminished vesicular murmur right mammary and axillary regions.

Sub-crepitant rales left supra-spinatus region.

Does not feel so well since coming here; insomnia is more persistent and aggravated here.

CASE XLIII. MAY 28, 1876.

Phthisis Pulmonalis of Two Years' Duration; Cavity; Marked Aphonia.

C. B——, aged 32, stone cutter. No hereditary taint discernable; has *had cough since February,* 1874; never spat blood; has decided aphonia of one year's duration; has fever, night sweats, impaired appetite; deep temporal fossæ; is lean; pulse 120, in the afternoon.

Inspection :—Diminished costal movement right summit, front.

Palpation :—Vocal fremitus decided, ditto.

Percussion :—Dulness right summit, front and back; ditto left infra-clavicular region.

Auscultation :—Tubular respiration and coarse crepitation right supra-clavicular region; cavernous respiration, whisper and gurgling, right infra-clavicular region; defective breath sounds and crepitant rales right supra-spinatus and infra-spinatus regions.

Tubal breath and sub-crepitation right inter-scapular region; base posteriorly normal. Broncho-vesicular respiration left, front, most decided over the infra-clavicular region; left base, posteriorly, normal.

Improved for about two months after reaching Colorado. Has been here nine months.

CASE XLIV. JUNE 11, 1876.

Phthisis Pulmonalis; Aphonia; Cavity.

J. C. L——, aged 28, locomotive fireman; has had cough since November, 1874. Spat blood in July, 1875, and frequently since then in small quantities. No hereditary tendency discoverable. Has lost 35 pounds in weight; pulse 120, 5 p. m. Has diarrhœa, loss of appetite and strength; coughs incessantly, and has complete aphonia. There is marked fever, dyspnœa, and the feet swell. Has been in Colorado three months; no improvement since arrival; dyspnœa more aggravated by residence here.

Inspection :—Diminished costal movement left infra-clavicular and mammary regions.

Palpation :—Negative results on account of the condition of the voice.

Percussion :—Dulness left summit, front and back; *crack pôt* resonance infra-clavicular region, left.

Raised pitch of percussion note right summit, posteriorly; tympanitic resonance right mammary and infra-mammary regions.

Auscultation :—Cavernous respiration, front and back, right summit; tubular respiration left summit, front and back; fine crepitation, ditto.

Supplemental respiration right mammary and infra-mammary regions.

A favorable issue to this case cannot be predicted here or elsewhere. Such cases are necessarily fatal wherever they go, or whatsoever they do.

ANALYSIS.

Of the above forty-four cases, thirty-five were males and nine were females; that is, 79.54 per cent. were males, and 20.45 per cent. were females.

The hypothesis most reasonably explaining so large a preponderance of males over females includes the fact that the former are more independent than the latter: can leave home and seek the benefits of a far-off country or clime with greater facility; men can travel alone, can break off from home associations and comforts more readily than women; husbands can, or do, frequently change their residence in the interest of their own health, when if the wife be the sufferer, the necessity of change of residence may not be so palpable.

However, notwithstanding the above facts, consumption seems to be more prevalent among males than females. Of one thousand cases reported by *Dr. C. J. B.* Williams, of London, six hundred and twenty-five were males, and three hundred and seventy-five females, or 62.5 per cent. of the former, and 37.5 per cent. of the latter. It would thus reasonably be supposed that the number of males seeking relief in climatic change would exceed the number of females.

In Dr. Pollock's twelve hundred cases, 60.75 per cent. were males, and 39.25 per cent. were females.

Of the forty-four cases, twenty-three were married, twenty were single, and one indefinite; the percentage of married being 53.48, unmarried 46.51, leaving out the one indefinite.

Pneumorrhagia occurred in thirty-two out of forty-two cases interrogated in relation to this symptom, there being two in the forty-four cases who were not questioned. The percentage then of those who bled from the lungs was 76.19, and of those who did not 23.80, the two indefinites not considered. In Dr. Williams' one thousand cases, it was 57. per cent.; in Dr. Cotton's one thousand hospital cases, it was 53.6; and in Dr. Pollock's twelve hundred hospital cases, it was 58.4. It will thus be seen that our forty-two cases furnish an unusually large percentage as having had hemorrhage from the lungs at some period of their history. Some may be disposed to explain the fact by reference to the influence of altitude; but while it is impossible at this date to determine the percentage of cases who had hemorrhage from the lungs before coming here, or the influence of the altitude in producing the symptom in those who had it after their arrival here, I can only say from memory, that the large majority of those of whom it is recorded, experienced the attack before they came to Colorado. Cases iv, vii, ix, xi, xii, xx, xxii, xxvii, xxxvii, xxxix, and xl, had hemorrhage while in the territory. In cases xi, xii, and xxxix, it was alarming. It was the cause of death in cases xii and xxxiv. With one or two exceptions, there had been previous attacks before coming to Colorado. In xi, xii and xxxix it proceeded from cavity, which explains the severity of the attack.

To date, June 15, 1876, 16 have died, of whom 9 were males and 7 females; percentage of deaths to whole number observed 36.36. The percentage of death in the males to all males was 25.71, while it was 77.77 for the females. This terrific mortality among the females can be satisfactorily explained by reference to the facts that of nine cases reported, seven were either in the third stage of the affection, had an acute type of the malady, or both lungs were extensively involved. They were all exceedingly unfavorable cases in their tendencies. Besides, the number is too small for generalization.

Either aphonia, or constant hoarseness, or hoarseness alternating with aphonia, existed in ten instances, of whom nine were males and one female. Percentage of laryngeal complication, of the characters above indicated, to all cases, was 22.72. Of the cases thus affected 90 per cent. were males and 10 per cent. females.

The number is again too small for generalization in the instance of the females. But it seems singular that over 22 per cent. of all the cases should have presented laryngeal lesion. I am prepared to assert, however, that at least six of the ten cases were thus affected before coming to Colorado, and perhaps one or two more of the remaining four. This consequently has little bearing, as showing the influence of our climate in the production of this distressing complication. One of the cases wintered in

Southern California (xxxvii) and the hoarseness, amounting at times to aphonia, was entirely relieved in a three-month's residence in the latter region, (Santa Barbara).

One other case (xix) has improved, remaining the while in this city.

On the whole, however, I regard the climate of Colorado as unfavorable to this complication.

Pneumorrhagia was fatal in two of the cases, and in each instance proceeded from a large cavity. The percentage of deaths from this cause to all the deaths was 12.5: while the percentage to the 44 cases was 4.54. Pollock mentions 21 cases of fatal hemorrhage, suffocative hemorrhage, as having occurred in the Brompton Consumption Hospital up to, and including the time, at which the "2d Medical Report" of that noted hospital was published, but does not give the percentage of deaths from that cause to either all the deaths or the total of cases.

Of the two deaths from this cause, in one, the fatal event occurred here in town; in the other instance, in Illinois. (Cases xii and xxxiv.)

Cavities existed in one or both lungs, when last observed, in 19 of the 44 cases; the percentage being 43.18. Of this number 9, or 47.36 per cent. have since died. Of the remaining 10, at last observation, 5 were stationary, 1 improving, 4 retrograding.

It is extremely difficult to state how many of the forty-four *improved, as a result of coming to this climate*, for several reasons. Many of the cases took treatment of some kind or other after coming; not a few improved for a time, and relapsed and died, or progressed toward inevitable dissolution. But still a certain percentage of the cases really did improve at such time, and in such manner, as to carry convincing proof to their own minds, as well as that of their medical attendant, that the benefit was derived from the "change of climate" and its concomitants.

In a few instances the improvement was so manifest, that the most common observer appreciated the change for the better. Nay, *cures* were effected.

As nearly as this problem can be solved is, with the above explanation, to place the number who *improved* at 19, being a percentage to all cases of 43.18. Case No. xx recovered; xviii, while experiencing severe relapses occasionally, has done exceedingly well; ditto xli; xxxix is much improved over his former condition; xxxi is in much better general health than formerly; xviii is a prodigy of disease, commingled with a certain degree of health; ix is doubtless faring much better than had he attempted a return to Chicago, where he contracted his disease; x is doing better here than would be possible in the "states"; xvii continued to improve for eighteen months after reaching Colorado, relapsed, but was in better condition last winter than the previous winter; xxii improved for months after he came here, but is losing ground now rapidly; xxv has recovered; xxviii, all things considered, has done well.

As to hereditary taint and *family* predisposition; It is noted that 13 of the 44 cases affirmed the existence of pulmonary consumption, or asthma, in one or both parents or grand parents. But the facts with regard to this point were not ascertained in 12 of the cases. This would leave 32 cases in which information of definite character on this point was obtained. *Excluding the indefinites* then, and computing the percentage for 32 cases, we find it to be 40.60; while if the indefinites are included in the computation, it is 29.54. I have no hesitancy in including asthma in the same category with pulmonary consumption, in considering the element of hereditary influence, for it appears to me that the former disease in parents or grand parents, as certainly entails pulmonary consumption on the offspring, as does the disease itself which is being considered.

But when *family* predisposition is considered, there are five more cases to be added to the above thirteen, and thus in the forty-four cases, eighteen had family predisposition. "*Family* predisposition," after the custom of Dr. C. J. B. Williams, includes not only those cases from whom the disease can be traced to parents or grand parents, but also the instances in which was established the fact that a brother or sister, maternal or paternal uncle or aunt, also had the affection.

The percentage of *family* predisposition in the forty-four cases, indefinites included, was 40.90; indefinites excluded, it was 56.25.

Compared with results obtained elsewhere, on a much larger scale, we find the one thousand and ten cases included in the Brompton Hospital Report, and in which hereditary taint was affirmed of those only whose parents were consumptive, the average per cent. was found to be 24.4; in three hundred and eighty-five cases analyzed by Dr. Fuller, which included grand parents, uncles and aunts, the per centum was 59; Dr. Pollock's twelve hundred, which included parents, brothers and sisters, only gave 30 per cent.; while Dr. Cotton's one thousand, similarly estimated, yielded 36.7 per cent.; Dr. Williams' one thousand cases, which included grand parents, parents, uncles and aunts, brothers and sisters, and cousins, in order to arrive at the percentage of *family* predisposition in contradistinction to hereditary descent, furnished 48.4; but estimating the purely hereditary cases, viz: those whose parents alone were affected, the result was 12 per cent.

Age at which the disease began:

The disease began in 1, between 10 and 20.
" " " 21, " 20 " 30.
" " " 15, " 30 " 40.
" " " 2, " 40 " 50.
" " " 2, " 50 " 60.

Three indefinites.

The decade of 10 to 20, gave 2.27 per cent.
" " 20 to 30, " 47.73 "
" " 30 to 40, " 34.09 "
" " 40 to 50, " 4.54 "
" " 50 to 60, " 4.54 "

Our small collection of cases conform, as will be seen from the above analysis, to the law long since established, e. g. that the decade from 20 to 30 furnishes the greatest number of cases.

The *average* age of attack in thirty-one males, in whom the date of the commencement of the disease was sufficiently well authenticated, was 31.31 years; age of four of the males indefinite, except as to the decade of attack.

The average age of eight of the females at the commencement of the attack, was 28.12 years. One indefinite, except as to decade.

This average for both classes somewhat exceeds the average age of attack in Dr. Williams' one thousand cases, in which it was 29.44 for the males, and 26.06 for the females; this for patients in the upper classes only.

Up to the last observation 40 of the 44 had lived an average of 47.12 months from the date of attack; that is, the average duration of the cases from the date of attack to date of last observation was nearly 4 years.

The average duration of Dr. Pollock's 1,200 cases up to the last observation was 30.6 months. It will thus be seen that the average duration of our 44 cases exceeds by over fifty per cent. the average duration of Dr. Pollock's cases; but Dr. Williams' 1,000 cases far exceeds in duration any collection of promiscuous cases that has yet been published; for the average duration of the disease in 198 who died was 7 years, 8.72 months, while the average duration of the disease in the 802 cases who were alive, when last heard from, had been 8 years, 2.19 months. Dr. Williams' fatal cases, as he truly asserts, afford "*the highest average among deaths from phthisis yet published.*"

The average duration of the disease in our 16 fatal cases, was 42 months —three and one-half years—greatly exceeding the average duration of life from the inception of the disease until death, as announced by Laennec, Louis and Bayle, Andral, and Sir James Clarke, but less than half the actual average duration of Dr. Williams fatal cases. In 112 fatal cases, analysed by Dr. Austin Flint, of New York, it was found to be "a fraction over thirty-three months."* It will thus be seen that the highest average duration of the disease is a result that has not been attained in Colorado, or even in America, so far as *published cases* are concerned. What results the future may yield, or an analysis of a much larger number of cases—as for example, 1,000—is difficult to determine.

The question, as to how long our 44 cases availed themselves of the supposed benefits of the climate of Colorado, is a pertinent one in this connection.

An analysis with reference to this phase shows that the average duration (up to the last observation) of sojourn in this State, was 12.72 months—nearly 13 months.

It has hitherto appeared that the average duration of the disease in the cases under consideration, up to last observation, was 47.12 months, and hence little more than one-fourth of the period of duration of the disease, on an average, has been spent in Colorado. This is certainly not giving the climate of Colorado a fair test. If its potency for cure is real, if this climate is what the consumptive needs to effect a cure or marked amelioration of his symptoms, he should take the treatment more continuously than is indicated in the above showing.

It is not my wish to theorize, but simply to present facts so far as it has been possible, or practicable, to obtain them; but admitting the proposition, for argument sake, that phthisis pulmonalis is a comparatively infrequent affection in the elevated regions of the earth, is it not an entirely different proposition as to whether, when once established, fully confirmed, its duration will be prolonged by immigration to those altitudes where it least frequently presents? Do cases of the disease originating in such regions have a longer duration, other things being equal, than in other portions of the world, where the disease much more frequently presents? Many think pneumonia, for example, is less prevalent in Colorado than in many of the States; but once getting a pneumonia, is it not quite as fatal, and oft times more quickly fatal, than a similar amount of lung lesion at sea level would be?

---

*—Flint on Phthisis: Philadelphia, 1875.

Considerations like the above led me to make the statement, in the opening of this article, that certain cases of consumption—or consumption of a certain type—would of necessity prove more rapidly fatal here than at sea level surrounded by ordinarily salubrious conditions of health. Such instances as those in which one lung is *extensively* involved, or both to a less extent; in which the inherent tendency to dissolution is obstinate and continuous; the digestion and assimilation greatly impaired; the nervous system profoundly disturbed and depressed, or exceptionably irritable; the mesenteric glands involved; an unusually high pulse and temperature standard. Such cases, I repeat, *will live longer under ordinarily salubrious surroundings and proper medication in the States—or at lower altitude.*

For the same reasons, an individual suffering from an attack of ordinary phthisis, but undergoing an exacerbation of cough, frequent pulse, dyspnœa, loss of appetite, weight and strength, would probably do quite as well to place himself under salubrious surroundings and well directed medical treatment until acute accessions have been measureably controlled, and then seek a higher altitude and the climatic conditions it furnishes, as to rush at once to the latter when in an unfavorable plight to engage upon a long and fatigueing journey, or to tolerate a considerable rarefaction of the air he breathes, associated with great daily variations of temperature as most elevated and mountainous regions are.

Notwithstanding, however, let those merely inclined, come early; so also the chronically inclined; and even the ordinarily phthisical. It is not infrequently an agreeable change for the latter, provided they are in condition to travel, as above stipulated.

Let such come then, and especially if they have means to subsist independently of worry and thought in reference to what they shall eat on the morrow, or wherewithal they shall be clothed. It would be well for them to bring friends or relatives with them, if such be necessary to their enjoyment or peace of mind; and then if they will lead an out door life, live out door winter and summer, ride much on horse in the open air and sunshine, subsist on wholesome nutritious diet, as good fresh milk, cream, fish, tenderloin or porter house beefsteak, getting all the sleep that is possible between the setting and the rising sun, and occasionally, as circumstances may demand, indulging in a little well directed treatment to relieve a troublesome cough, or diarrhœa, night sweats, or loss of appetite, or even taking cod oil in some form, especially in winter, to aid the nutritive process, my word for it, they will get well if cure lays within the range of possibilities; and the more nearly the programme is carried out, the greater the chances of success.

But a mere moiety of the consumptives coming here for relief can or will pursue such course. Well, let them approximate it as nearly as possible: as nearly as taste, financial ability, stage of the affection, etc., will permit.

The above report does not include many subjects from that large number of "merely phthisically inclined," who have come to Colorado during the fifteen last years to thwart their tendencies to the disease, and who have, there is good reason to believe, been successful in their efforts in numerous instances.

To this class I can cheerfully commend the climate of Colorado.

On the contrary, the forty-four cases reported, were all cases of "consumption," in one stage or other, unless, as is somewhat probable, the first case reported was one of "pleurisy with effusion," or the latter following pneumonia.

For the benefit of that class of invalids for whom this paper has been prepared, as well as for all interested, I take pleasure in appending hereto a "Weather Report," compiled and kindly furnished the State Board of Health, by Sergeant James A. Barwick, of the United States Signal Service office, in this city.

In the tables will be found generalized all conceivable information in regard to the weather at this place (Denver), for the last five years, with the exception of the mean humidity, which is given for three years.

It is hoped the perusal of these tables will give the reader a distinct idea of the leading peculiarities of our climate.

Table No. 1.

MEAN ANNUAL AND SEASONAL BAROMETER—HIGHEST AND LOWEST MEANS.

DATE.	Mean Annual Bar.	Mean *Winter Bar.	Mean Spring Bar.	Mean Summer Bar.	Mean Fall Bar.	Highest Mean Bar.	Lowest Mean Bar.
1872	30.020	29.902	29.952	30.091	30.064	30.124 Aug.	29.889 Apr.
1873	30.008	29.919	29.955	30.079	30.069	30.126 Aug.	29.851 Feb.
1874	30.001	29.924	29.956	30.065	30.043	30.112 Oct.	29.870 Feb.
1875	29.993	29.941	29.945	30.067	30.053	30.143 Sept.	29.883 Mch.
1876	29.993	29.934	29.919	30.053	30.039	30.090 Sept.	29.857 Mch.
Mean Bar. for 5 yrs.	30.003	29.924	29.945	30.071	30.054	30.119	29.870

To find the Mean height of the Barometer in the above table, uncorrected for elevation, subtract 5.220 inches. For example: Mean Barometer for 1872 is 30.020, corrected for elevation. Now 30.020—5.220=24.800, the actual Mean height of Barometer.

Table No. 2.

MEAN ANNUAL AND SEASONAL THERMOMETER—MAXIMUM, MINIMUM, AND RANGE OF SAME.

DATE.	Mean Annual Ther.	Mean *Winter Ther.	Mean Spring Ther.	Mean Summer Ther.	Mean Fall Ther.	Maximum Ther.	Minimum Ther.	Range of Ther.
1872	47.86	28.89	46.75	68.78	47.53	95	—22	117
1873	48.03	29.21	45.71	70.41	48.53	99	—17	116
1874	50.04	26 30	47.03	73.04	51.37	102	—11	123
1875	48.80	26.26	46.03	69.17	51.03	97	—29	126
1876	49.72	34.60	46.94	70.78	50.11	101	—25	126
Mean Ther. for 5 yrs.	48.89	29.05	46.49	70.44	49.71	98.80	—20.80	121.60

A dash, thus (—), means below zero.

* *The winter tables* are *for the winters* of 1871–2, 1872–3, 1873–4, 1874–5, 1875–6.

Table No. 3.

MAXIMUM AND MINIMUM THERMOMETER BY SEASONS.

Date.	Maximum Temp. for Winter.	Minimum Temp. for *Winter.	Maximum Temp. for Spring.	Minimum Temp. for Spring.	Maximum Temp. for Summer	Minimum Temp. for Summer	Maximum Temp. for Fall.	Minimum Temp. for Fall.
1872	66	—22	91	10	95	43	88	7
1873	62	—17	84	10	99	42	90	—1
1874	62	—11	92	12	102	40	92	8
1875	68	—29	87	1	97	38	91	5
1876	66	—3	85	3	101	38	90	3

Table No. 4.

MEAN ANNUAL AND SEASONAL HUMIDITY.

Date.	Mean Annual Humidity.	Mean Humidity for *Winter.	Mean Humidity for Spring.	Mean Humidity for Summer.	Mean Humidity for Fall.
1874	49.56	57.57	52.00	42.53	46.97
1875	46.27	53.13	44.53	43.47	48.17
1876	41.71	41.03	44.40	39.17	39.70

Table No. 5.

ANNUAL AND SEASONAL RAINFALL.

Date.	Annual Rainfall.	Rainfall for *Winter.	Rainfall for Spring.	Rainfall for Summer.	Rainfall for Fall.
1872	17.95 inches.	1.28 inches.	7.54 inches.	6.41 inches.	2.94 inches.
1873	11.73 "	0.66 "	3.40 "	5.65 "	1.78 "
1874	13.46 "	1.90 "	4.62 "	5.24 "	2.06 "
1875	17.25 "	1.15 "	4.57 "	6.72 "	4.39 "
1876	20.12 "	0.91 "	11.59 "	4.29 "	2.22 "

Table No. 6.

ANNUAL AND SEASONAL VELOCITY OF WIND.

Date.	Annual Velocity of Wind.	Velocity for *Winter.	Velocity for Spring.	Velocity for Summer.	Velocity for Fall.
1872	46.197	13.489	15.252	10.374	9.582
1873	48.812	10.971	13.823	12.199	11.480
1874	53.530	10.472	14.606	14.303	13.404
1875	52.219	12.009	16.323	12.703	10.623
1876	53.884	12.201	16.089	12.765	12.749

* The winter tables are for the winters of 1871-2, 1872-3, 1873-4, 1874-5, 1875-6.

Table No. 7.

MEAN ANNUAL AND SEASONAL DIRECTION OF WIND.

Date.	Mean Annual Direction of Wind	Mean Direction for *Winter.	Mean Direction for Spring.	Mean Direction for Summer.	Mean Direction for Fall.
1872	South.	South.	North.	South.	South.
1873	South.	North.	North.	South.	South.
1874	South.	South.	South.	South.	South.
1875	South.	North-east.	South.	South.	South.
1876	South.	South.	North.	South.	South.

* The winter tables are for the winters of 1871–2, 1872–3, 1873–4, 1874–5, 1875–6.

Table No. 8.

WINDS IN RELATION TO RAIN OR SNOW AND CLEAR WEATHER.

Months.	Winds most likely to be followed by Rain or Snow.			Winds most likely to be followed by Clear Weather.		
January,	North,	North-east,	East.	North-west,	West,	South-west.
February,	North-west,	North,	North-east.	South-west,	South,	South-east.
March,	North,	North-east,	East.	North-west,	West,	South-west.
April,	North,	North-east,	East.	South-west,	South,	South-east.
May,	North,	North-east,	East.	West,	South-west,	South.
June,	North-west,	North,	North-east.	West,	South-west,	South.
July,	North-west,	North,	North-east.	West,	South-west,	South.
August,	North,	North-east,	East.	South-west,	South,	South-east.
September,	South,	South-east,	East.	West,	North-west,	North.
October,	South,	South-east,	East.	South-west,	West,	North-west.
November,	North-west,	North,	North-east.	South-west,	South,	South-east.
December,	North-west,	North,	North-east.	South-west,	South,	South-east.

Table No. 9.

EXHIBITING THE NUMBER OF CLEAR, FAIR, CLOUDY, RAINY & SNOWY DAYS.

Date.	Number of Clear Days.	Number of Fair Days.	Number of Cloudy Days.	Number Days on which Rain fell.	Number Days on which Snow fell.
1872	138	151	76	74	37
1873	153	155	57	48	42
1874	143	161	61	63	37
1875	125	172	68	79	40
1876	168	143	54	62	44

SECOND ANNUAL REPORT

OF THE

State Board of Health,

OF COLORADO

FOR THE YEAR A. D. 1877.

ANE LIBRARY

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1878.

STATE OF COLORADO,
Office of THE STATE BOARD OF HEALTH,
DENVER, COLORADO.

To His Excellency JOHN L. ROUTT, *Governor of Colorado:*

SIR:—By direction of the Board, I have the honor to transmit herewith, Second Annual Report of the State Board of Health (for the year 1877).

Very respectfully,
Your obedient servant,
CHARLES AMBROOK, M. D.,
Secretary.

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MEMBERS OF THE STATE BOARD OF HEALTH OF COLORADO.

F. J. BANCROFT, M. D.,	Denver.
W. H. WILLIAMS, M. D.,	Denver.
H. A. LEMEN, M. D.,	Denver.
A. V. SMALL, M. D.,	Trinidad.
T. G. HORN, M. D.,	Colo. Springs.
W. EDMONDSON, M. D.,	Central.
CHARLES AMBROOK, M. D.,	Boulder.
D. H. DOUGAN, M. D.,	Leadville.

OFFICERS:

F. J. BANCROFT,	President.
CHAS. AMBROOK,	Secretary.
W. H. WILLIAMS,	Treasurer.

ERRATA.

On page 24, thirty-fourth line, for Dr. McGillgenddy read "Dr. McGillycuddy."
On page 72, for J. V. Jones read "J. N. Jones."
On page 72, fifteenth line, for Storain creek read "St. Vrain creek."
On page 131, thirty-second line, for Dr. F. A. Barker read "Dr. F. A. Barber."
On page 35, first line sec. II, for intentional murder read "intentional destruction."

ACT ESTABLISHING THE BOARD.

AN ACT
TO
ESTABLISH A STATE BOARD OF HEALTH.

[Session Laws, 1876.]

SECTION 1. That a Board of Health is hereby established, which shall be known under the name and style of the State Board of Health. It shall consist of nine members, as follows: a president, secretary and seven members, who shall be appointed by the governor; and the members first appointed, with the exception of the secretary, shall be so designated by the governor that the term of office of two shall expire every two years on the last day of January; thereafter, the governor, with the consent of the senate, shall biennially appoint two members, to hold their office for six years, ending January thirty-first. Any vacancy in said Board may be filled, until the next regular session of the general assembly, by the governor.

SEC. 2. The State Board of Health shall have general supervision of the interests of health and life of the citizens of this state. They shall especially study the vital statistics of the state, and endeavor to make intelligent and profitable use of the collected records of death and sickness among the people. They shall carefully study the influence of the climate upon disease and health, in different localities in the state, for the benefit of the citizens thereof, as well as for the large number of invalids who seek relief in Colorado. They shall make sanitary investigation and inquiries respecting the cause of disease, and especially of epidemics; the causes of mortality; and the effect of localities, employments, conditions, ingesta, habits and circumstances, on the health of the people. They shall, when required *or when they deem it* best, advise with the officers of the Government or other State Boards, in regard to the location, drainage, water supply, disposal of excreta, heating and ventilation, of any public structure or building. They shall from time to time recommend standard works on the subject of hygiene for the use of the schools of the state.

SEC. 3. The Board shall meet semi-annually at Denver, and at such other places and times as they deem expedient. A majority shall be a quorum for the transaction of business. Should the office of president or secretary become vacant, by death or otherwise, the Board may fill said office from their number at the next regular meetting.

SEC. 4. The secretary shall hold his office so long as he shall faithfully discharge the duties thereof, but may be removed for just cause at a regular meeting of the Board, a majority of the members voting therefor. He shall keep his office at Denver, and shall perform the duties prescribed by this act or required by the Board. He shall keep a record of the transactions of the Board; shall have custody of all books, papers, documents and other property belonging to the Board, which may be deposited in his office; shall, so far as practicable, communicate with other State Boards of Health, and with Local Boards of Health within the state; he shall keep and file all reports received from such Boards, and all correspondence of the office appertaining to the business of the Board. He shall, so far as possible, aid in obtaining contributions to the library and museum of the Board. He shall prepare blank forms of returns and such instructions as may be necessary, and forward them to the clerks of the several Boards of Health throughout the State. He shall collect information, with the assistance of each member of the Board, concerning vital statistics, knowledge respecting disease, and all useful information on the subject of hygiene; and through an annual report, and otherwise, as the Board may direct, shall disseminate such information among the people. It shall be his duty to act as correspondent in answering all inquiries made by non-resident physicians and invalids, who are at liberty to call upon him for special information as to the sanative influence of this climate.

SEC. 5. The State Board of Health shall have the general direction and control of the system of vital statistics of the state, in so far as the editorial work and statistical plans of the same are concerned.

SEC. 6. It shall be the duty of all health physicians, and also of *the clerks of* Local Boards of Health of each town, village and city, *and the regular physicians* of each public institution in the state, at least once in each year, to report to the State Board of Health their proceedings and such other facts as may be required by said State Board.

SEC. 7. In order to afford to the Board better advantages for obtaining knowledge important to be incorporated with that collected through special investigation, and from other sources, it shall be the duty of all officers of the state, the physicians of all mining or other incorporated companies, or the president or agent of any company chartered, organized or transacting business under the laws of this state, so far as practicable, to forward to the State Board of Health any information which they possess bearing upon public health, which may be requested by said Board for the purpose of enabling it better to perform its duties of collecting and distributing useful knowledge on the subject.

SEC. 8. Repeated by Sec. 87, General Laws.

Approved February 10, 1876.

AN ACT

APPROPRIATING MONEY FOR THE MAINTENANCE OF THE STATE BOARD OF HEALTH.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. That there is hereby appropriated out of any funds in the treasury, not otherwise appropriated, the sum of five hundred dollars annually, for the use of the State Board of Health, and the auditor is hereby authorized to draw his warrant on the state treasurer for the same, payable to the treasurer of the Board of Health, and a receipt therefor signed by the president and countersigned by the secretary of said Board, shall be a sufficient voucher therefor.

Approved March 7, 1877.

AN ACT

CONCERNING A BOARD OF HEALTH.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. The Board of Health established by act of the Council and House of Representatives, approved February 10, 1876, shall have power to make by-laws and all needful rules and regulations for its own government; and any member failing to obey said by-laws or to comply with said rules and regulations, shall be subject to removal upon a vote of a majority of the members of said Board. And upon a certification of the same to the governor of the state by the secretary of the Board, the governor shall declare the office vacant, and immediately fill the vacancy by the appointment of some other person.

SEC. 2. All money received by the Board, from the state or otherwise, shall be expended in the manner deemed best by the Board, for carrying out the object for which it was created.

SEC. 3. Section eight of an act to establish a Territorial Board of Health, approved February 10, 1876, is hereby repealed.

Approved March 22, 1877.

EXTRACTS FROM THE LAWS.

CHAPTER LXXXII. SECTION 1. The county commissioners of any county, respecting which no other provision is or shall be made by law, shall be a Board of Health for their respective counties, and the county clerk shall be the clerk of such Board, and shall keep a record of their proceedings, in a book to be provided for that purpose, at the expense of the county.

SEC. 2. Every Board of Health may appoint one or more physicians to the Board, who shall be the health officer or officers of the county, city or town for which he is appointed, and shall hold his office during their pleasure, and they shall establish his salary, or other compensation, and shall regulate all fees and charges of every person employed by them in the execution of the health laws, and of their own regulations.

SEC. 37. The mayor and aldermen of each incorporated city, and the president and council, or trustees of each incorporated town in this state, respecting which no other provision is or shall be made by law, shall have and exercise all the powers and perform all the duties of a Board of Health, as provided in this act, within the limits of the cities or towns respectively of which they are such officers, and in all parts and portions of each and every county not represented by town or city organization, the Board of Health shall consist of the county commissioners and clerk of the county.

SEC. 38. It shall be the duty of all physicians, surgeons, and midwives to keep a registry of all births and deaths at which they have professionally attended; showing, in case of birth, the time and place of birth, name of the father, and maiden name of the mother, and their residence, the sex and color of the child, and whether it be born alive or dead; and showing, in cases of death, the time, place and cause of death, when and where the disease was contracted, the name, age, sex, color, and condition, (whether single, married or widow), occupation, residence, and place of birth of the deceased; *provided*, that when two or more surgeons, physicians, or midwives may have attended professionally at any birth or death, that surgeon, physician or midwife, who is the oldest in attendance, shall make the registry.

SEC. 39. It shall be the duty of the physicians, surgeons and midwives to deposit with the clerk of the Board of Health of the county, town or city, in which such births or deaths occur, respecting which no other provision is or shall be made by law, quarterly reports of such births and deaths, on or before the last day of March, June, September and December of each and every year.

SEC. 40. All Boards of Health which exist now or may be established by the provisions of this law, shall make an annual report to the State Board of Health, on or before the thirty-first day of December in each and every year, containing all marriages, and all births and deaths occurring in their respective districts, giving such facts as are set forth in section 38 of this act, and such other information as shall be of interest to the public.

SEC. 42. Any person failing to discharge and perform any of the acts and duties imposed by sections 38 and 39 of this act, shall, for *every such failure*, be deemed guilty of a misdemeanor, and upon conviction thereof, fined in a sum of not less than five or more than twenty dollars.

CHAPTER LXIII. SEC. 7. Every person having authority to join others in marriage, shall keep a record of all marriages solemnized before him, and within three months transmit a certificate of every marriage, containing both christian and surname, to the clerk of the county in which such marriage took place. Any person refusing or neglecting to make such return within the above required time, shall forfeit for every such offense, the sum of one hundred dollars, to be recovered with costs, by the recorder.

SEC. 8. The clerk shall record all such returns of marriages, in a book to be kept for that purpose, within one month after receiving the same. If any recorder shall neglect or refuse to record within the said time any return to him made, he shall forfeit one hundred dollars, to be recovered with costs, by any person who will prosecute for the same.

SEC. 9. The books of marriages to be kept by the respective recorders, and copies of entries therein, certified by him, under his official seal, shall be evidence in all courts.

SEC. 10. If any person, authorized to solemnize any marriage, shall willfully make a false return of any marriage, or pretended marriage, to the clerk; or if the clerk shall willfully make a false record of any return of a marriage, he shall be deemed guilty of a misdemeanor, and shall be punished by a fine of not less than one hundred dollars, and by imprisonment of not less than three months.

AN ACT

RELATING TO THE CONSTRUCTION OF BUILDINGS USED FOR PUBLIC ASSEMBLAGES.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. Every room or building intended to be used as a theatre, opera house, music hall, concert hall, public school or church, or other like place of public assemblage hereafter built or constructed, *shall be provided with* at least one doorway, of not less than five feet in width, for each two hundred and fifty persons which might be seated within such building, in the part thereof intended for public assemblage, and with proper and sufficient ways and passages leading to and from every such doorway, so that in case of fire or other sudden alarm, those who may be within such building may speedily and safely escape therefrom.

Sec. 2. No room or building intended for use as a theatre, opera house, music hall, concert hall, public school or church, or other place of public assemblage, heretofore constructed and not in conformity with the provisions of this act, shall be rented, leased or occupied for any such purpose until the same shall be altered to conform to this act.

Sec. 3. Every proprietor who shall hereafter build or procure to be built, or shall lease or procure or permit to be used as a theatre, opera house, concert hall, music hall, public school or church, or for any other like public assemblage, any building not in conformity to this act, shall be deemed guilty of a misdemeanor, and upon conviction thereof, fined in a sum not exceeding five hundred dollars.

Sec. 4. No action shall lie to recover the rent on any lease or contract made after this act shall take effect for the use or occupation of any room or building used as a theatre, opera house, concert hall, music hall, public school or church, or other like place of public assemblage, unless such room or building was at the time of such renting, use or occupation, provided with doorways and passages and means of safe escape therefrom in case of fire, in conformity with this act.

Sec. 5. All doors provided for the doorways of every such room or building, shall open outwards, and every person using or occupying any such room or building as a theatre, opera house, concert hall, music hall, public school or church, or for other like public assemblage, shall, during the whole of every exhibition, performance or assemblage therein, cause all the doors thereof to be left unfastened or latched or barred upon the inner side only, and so that any person may readily and speedily open the same from the inner side of such room or building; and shall cause all the stairways and other ways and passages leading to every such door to be kept open and free from persons seated or standing therein and from other obstructions; and any person failing to observe this section shall be deemed guilty of a misdemeanor, and upon conviction thereof fined in a sum not exceeding two hundred dollars.

Sec. 6. Whenever any building or buildings, shall be hereafter erected, for the purpose of accommodating public assemblages, and the rooms intended for such purpose shall not be on the first floor of such building, it shall be the duty of the persons erecting the same to provide and erect, at least two fire-proof stairways, of ample dimensions, sufficient for the sudden egress of the assemblies of the same.

SEC. 7. If any lives shall be lost by reason of the willful negligence and failure to observe the provisions of this act, the person through whose default such loss of life was occasioned shall be deemed guilty of manslaughter, and punished by a fine not less than one thousand nor more than five thousand dollars, or imprisonment in the penitentiary not less than six months nor more than ten years, or both such fine and imprisonment in the discretion of the court.

Approved February 20, 1877.

MEMBERS OF THE BOARD.

NAMES.	RESIDENCE.	COMMISSION EXPIRES.
F. J. Bancroft, *President*	Denver	Jan. 31, 1884.
W. H. Williams, *Treasurer*	Denver	Jan. 31, 1884.
H. A. Lemen	Denver	Jan. 31, 1884.
A. V. Small	Trinidad	Jan. 31, 1884.
T. G. Horn	Colorado Springs	Jan. 31, 1884.
W. Edmondson	Central	Jan. 31, 1882.
Charles Ambrook, *Secretary*	Boulder	Jan. 31, 1882.
D. H. Dougan, *Assistant Secretary*	Alma	Jan. 31, 1880.
One Vacancy		

COMMITTEEES FOR THE YEAR 1877.

Epidemics, Endemics and Contagious Diseases—R. J. Collins, M. D.
Climate, as related to Classes of Disease—H. A. Lemen, M. D.
The Mineral Springs of Colorado—T. G. Horn, M. D.
Ozone, Electricity and Electrical Storms: their influence on Health—T. N. Metcalf, M. D.
Altitude: its influence on Health—W. Edmondson, M. D.
Illuminating Gases and Fluids—T. M. Smith, M. D.
Influence of Climate on the Young—W. H. Williams, M. D.
Foods, Drinks and Water Supply—A. V. Small, M. D.
Sewers and Sewage—F. J. Bancroft, M. D.

COMMITTEES FOR THE YEAR 1878.

Epidemics and Contagious Diseases—Dr. Small, of Trinidad.
Ozone, Electricity and Electrical Storms—Dr. Ambrook, of Boulder.
Illuminating Oils—Dr. Ambrook.
Clothing and Ventilation—Dr. Horn, of Colorado Springs.
Altitude, its Influence on Health—Dr. Edmondson, of Central.
Filth and its Disposal—Dr. Lemen, of Denver.
Influence of Climate on the Young—Dr. Bancroft, of Denver.

REPORT OF THE BOARD.

Office of the State Board of Health,
Denver, Colorado.

To His Excellency, John L. Routt, *Governor of Colorado:*

Sir—The following address, papers and tables, are respectfully submitted as the Report of this Board for the year 1877.

While it is not as complete as could be desired, yet when the vast size of our state, its sparsely settled condition, and the short time that has elapsed since our public health law went into operation (June, 1877,) are all considered, the impossibility of obtaining more extended statistics is evident.

The Board has endeavored to obtain the assistance of a corps of local correspondents which should include the health officer of each city, town and county, but owing to the neglect of many local authorities to organize as Boards of Health, and appoint health officers, the desired assistance has, in many places, been impossible to obtain; but we are glad to state that interest in this matter is becoming more general with the local authorities as well as with members of the medical profession, and reports both for sanitary and vital statistical purposes are confidently expected.

The health of our state, with the exception of the recent epidemic of small-pox in the Mexican counties, has been good. Some scarlatina has prevailed in Arapahoe, Boulder and adjoining counties, yet without the great fatality attending it in other states.

That the spread of such diseases could have been prevented, had the proper sanitary measures been taken, is proven by the suppression of small-pox by the authorities of the city of Denver and those of Arapahoe and Sagauche counties.

We respectfully request legislation to perfect and enforce present laws upon certain subjects, particular mention of which is made in some of the following papers. These subjects are, criminal abortion, which, despite the enlightenment of our age, still saps the foundation and weakens the walls of our national strength; the dangers of the commonly-used fluid miscalled kerosene; and the care of the insane within our borders. The need is imperative for a state asylum in which these unfortunates, found in all classes of society, can be properly cared for.

We have had pleasant correspondence and interchange of courtesies with the State Health Boards of Alabama, California, Connecticut, Georgia, Illinois, Kentucky, Louisiana, Massachusetts, Maryland, Michigan, Minnesota, Mississippi, New Jersey, North Carolina, Tennessee, Rhode Island, Virginia and Wisconsin, in all of which states sanitary measures are rapidly gaining ground; and there is little doubt that soon the list of State Boards will be limited only by the number of states, for both in this country and in Europe the value of such Boards is becoming rapidly apparent and acknowledged, it being self-evident that the wealth of a community must largely depend upon the health thereof.

If a National Board could be formed which should compile from the work of the State Boards, such information as would be generally useful concerning climates, springs, &c., in reference to their effect upon various diseases, great benefit would accrue therefrom to our people, and to those of foreign lands. We would suggest the propriety of a memorial to Congress upon this subject.

F. J. BANCROFT, M. D.,
CHAS. AMBROOK, M. D., *Sec'y.* *Pres't of the Board.*

ANNUAL ADDRESS OF THE PRESIDENT.

BY F. J. BANCROFT, M. D.

Gentlemen of the State Board of Health:

LADIES AND GENTLEMEN—I welcome you here to-day with even a greater pleasure than that with which I greeted you last year. *Then* we were *beginning* a work, and the work itself was the principal subject of our thoughts. Now we not only better comprehend that work, with an expanded realization of its magnitude and responsibility, but we have been made aware of the value of our labors already performed, by the numerous applications for our last year's report, made by multitudes, inside and out of our borders; and also by the many references thereto made by the press and individuals. And this assurance that we work not in vain, is what adds to my pleasure in meeting you to day, for now we have a tangible standing in our field of labor among sister societies, and before the world-wide public. And as success, especially in young undertakings, brings strength and fresh energy, we begin our new year with every hope of being able to accomplish even more than is expected of us for the prevention of the physical woes of our brethren.

To the subjects for information upon which the civilized world looks to us with greatest interest, namely: pulmonary consumption, bronchitis, asthma, etc., etc.; their history in Colorado, and the localities best adapted to the benefit of sufferers from each, we have as yet given only partial attention. They are topics of such importance, demanding such full and exhaustive treatment, research and inquiry, that they cannot be hastily handled; but I trust that at next year's meeting we may be able to present such tabular and statistical knowledge as will thoroughly explain the capabilities of our climate for the relief or cure of these diseases.

Feeling that there is nothing in the way of explanation or reminder necessary for me to say to-day, I turn now to my own subject, which, in its antecedent bearing upon *prevention* of the diseases just mentioned, as well as of many others, has an importance of its own second to none;—

"THE AIR WE BREATHE."

The parts of oxygen, carbonic acid, nitrogen and watery vapor, that enter into the composition of pure air, are to be considered only so far as they, in their pure state serve to support life; and only so far, also, as they affect health when they are vitiated with organic and inorganic substances.

With our limited knowledge of the conditions of the atmosphere, we must leave to speculation in some measure, the extent and manner by which diseases are communicated from one person to another, by floating disease germs, or puss cells, and to what extent diseases are engendered by vibriones, monads, cryptogams, gases and inorganic material in the air. That particles of living matter, so minute that the largest of them are but a thousandth part of an inch in diameter, are always present in the atmosphere, and that they act, at times, as the real morbific poison in disease, rather than the bearers of such poison, there is but little doubt.

If we admit that one case of disease is caused by the admission of these living atoms into the protoplasm of the living tissues, which fact has been to my mind well established, it is then impossible to say where the diseases from this cause commence, or where they end.

The varieties of germs, or living atoms in the air, are undoubtedly multitudinous, though but a small number of these varieties probably exert any specific effect upon the human economy; but of those noxious to human life, all kinds, no matter whether they emanate from some diseased person, or from waste and putrid matter, if they gain access to the human body and multiply there, always produce effects upon the blood and living tissues which are similar in kind and vary only in intensity.

As, for instance, the virus of measles always engenders measles, the same of small-pox, etc., etc. The germs of typhoid fever, after gaining lodgment in the body, develop invariably into the same fever, whether derived from the excretions of a person suffering from the disease, or from the ferments of filth.

The virus of typhus fever, puerperal fever and kindred ills, may *be produced by air* or water pollutions, but the malady thus engendered may be *perpetuated* by communication from one person to another. There are other diseases induced by disease germs, which are not, so far we know, transmitted by contagion.

There are probably no places upon land or sea where animal and vegetable life exist, wherein the atmosphere is perfectly free from germinal matter; but in this country no localities are more free, in this particular, than the dry, arid and sparsely settled portions of the western states and territories, for here the greater part of the carcasses of animals will dry before putrescence begins; dryness, light and altitude being unfavorable to germ life.

The air may be infected with germinal matter by the breath and excretions of sick people, by the gases that arise from the ferments or putrefaction of all organic matter, more especially from the refuse of dwellings, as bones, vegetables, etc., manure-heaps, privies, henneries, pig-pens, dead animals and sewage. Furthermore, it may be infected by evaporation; indeed the humidity of the atmosphere is often essential to this life and multiplication, or at least to its increased virulence.

When the yellow fever was epidemic at Newbern, North Carolina, in 1864, Dr. Hand, then medical director of the department, observed that soldiers going from the camp, which was situated outside of the city limits, during the day-time, rarely or never took the disease; but those whose duty called them to pass portions of the night there, were extremely liable to contract it; showing that the virus was increased, and more fully disseminated by the dampness of night. That the malaria gains force in the humidity of night, and then reaches out into otherwise salubrious places, is well known.

The evaporation from gutters, pools of standing water and slop-holes, are common sources of air pollution; and the dews which fall in feculent places, absorb thence organic matter, which is borne abroad upon the morning breezes. But a more fruitful source of air contamination is rife in the dry seasons, when the deep water that has become impregnated with filth, comes to the surface by capillary action of the soil, and is volatilized.

It has long been observed, that the droughts, especially those following heavy rain falls, have invariably been the periods in which the zymotic diseases have been most common and fatal in Denver. This fact is owing, in all probability, to the great dryness which brings up to the surface of the ground, for evaporation, the deep waters which are but the washings of a thousand unclean commodes and cesspools.

There can be no doubt that the attributes of the atmosphere, as well as the seasons of the year, determine the variety, and have a great effect in either multiplying or diminishing the living atoms in it.

It is well known that one form of living atoms is destroyed by another, and that the latter one seems to grow upon the residue left by the earlier form.

Disease germs that prevail in the warm months are of a kind that produce more generally affections of the alimentary canal, as diarrhœa, dysentery, cholera, cholera infantum; and with the autumnal months comes typhoid fever. During the winter months the eruptive diseases such as small pox, scarlet fever, etc., and affections of the air passages and lungs, as diphtheria and pneumonia, gain strength.

There are instructive lessons to be learned in reference to the nature and causes of disease in this far western and but recently settled country. No well authenticated cases of diphtheria occurred in Colorado prior to 1872, and yet the state had been settled twelve years, and contained 30,000 people. Whether the seeds were transported in clothing or by mail matter, or whether they were wafted on the eastern winds from Kansas over four hundred miles of uninhabited prairie none can say. But that in the filthiness of some of our towns they have taken root, and that the harvest has already been the lives of nearly fifty children, if not more, we sadly know.

An acquaintance of mine, whose home is in the extreme western portion of New Mexico, a hundred miles from any place of note, stated to me that he had not experienced a cold for one year and a half, and not until he came to Denver to remain a few weeks. The statement that they "had to visit the settlement to take a cold," has been made in my presence by so many who live at the extreme outposts in this state and adjoining territories, that the question has suggested itself, why is the frontiersman more exempt from cold-catching than others? for he suffers as much as the townsman from vicissitudes of weather, and *more* from exposure, scantiness of clothing and insufficiency of nutritious diet.

Furthermore, I learn from army officers, and notably from Dr. McGillgeuddy, U. S. A., that in the war against the Sioux in the northwest, the men while in the field away from their regular posts, rarely or never took cold, no matter how great the exposure to wet and cold weather, or the hardships endured; but that on their return to permanent barracks or to the dense settlements, cold-taking, bronchitis and pneumonia were not uncommon among them.

The query arises: May not cold-catching proceed from disease *germs?*

It is well known that the common house-fly depends upon the dung heap and unclean places about fixed habitations for its rapid propagation, and that the accumulations of filth, common to populous places, are the materials in which are reproduced these forms of minute organisms, which are the most deadly poisons to human life. The microscope reveals that the increase of germ life is very rapid—that the progeny of one germ may number millions in one day. As Dr. Lionel S. Beale says:

> They may remain so quiescent for months that no one would believe the germs were in existence; but in a night the air or water of a district may become peopled with countless multitudes of beings, not one of which was to be found a few hours previously.

If such changes take place, they may occur in populous localities where certain conditions are favorable to them, and may not occur in sparsely settled places where such conditions do not exist. If cold-catching is a zymotic disease, the above facts explain why it may occur in one place and not in another, and why it is often epidemic, and why, from difference among the germs, and in their mode of action, pharyngitis is a prominent sympton in one epidemic, bronchitis in another, muscular soreness in a third, and why other attacks commence with a chill.

Exposure to inclement weather, sitting in a draft, or other means of extraction of heat from the body when in a depressed state, which are the causes generally assigned for cold-catching, would be liable, it seems, to secure always the same effect; but the exposure occuring among a thousand persons is not relatively greater at one time than at another, yet cold-catching appears periodically, and with the different symptoms cited above.

Accepting the possibility that it may be of zymotic form, improved sanitation may greatly lessen the extent and severity of our too general epidemics of influenza.

It would appear from all that we know of the emanations of filth, that a certain degree of concentration is necessary for harm; as, for instance, the effluvia from a leaky waste pipe escaping into a sleeping apartment is destructive to life, but the same gases, discharged from the pipe at the house-top into the open air, are almost harmless.

There are certain portions of nearly every town or city, which, from location, narrowness of streets, overcrowding, and filth accumulations, favor the growth of bactereal life, and preserve it in a most concentrated state; in these places ill health and disease are seen in *every phase. In* other portions of the same town where location, construction and hygienic measures lessen the possibilities of such life, there is a corresponding diminution of sickness.

There are townships and districts, which, from flatness, natural dampness and difficult drainage, necessarily suffer from sickness far worse than more favored localities; but as a rule, other things being equal, that form of bactereal life which is harmful to humanity, exists in ratio to the density and cleanliness of population. In other words, the residents of a sparsely settled country are much less liable to be affected with any of the zymotic class of diseases than those in a populous country; and further, all sick persons whose maladies have been produced, or made worse by germ life, are more likely to find relief in the atmosphere which is as free as possible from these particles, rather than where they exist in abundance.

It is, perhaps, on this account that an ocean voyage is so often beneficial; and it is for the same reason more than for any other, that the sanitariums, which have deservedly met with the most favor in this country, have been located in isolated districts or in a new country.

In this connection, it is safe to predict that the vast and almost uninhabited region, reaching a thousand miles west of us, and extending from British America to the Gulf of Mexico, embracing ranges of lofty mountains, charming parks, rolling table-lands and fertile valleys, with endless variety of hot and cold springs, highly electric atmosphere, rushing streams, frequent summer showers and beautiful flora, all contributing to the production of ozone, will, in time, contain the great health resorts of America.

If the general government would appoint a number of eminent medical men to explore this region, analyze its springs, and point out such portions of it as, on account of climate and surroundings, would be suitable for the relief of this or that ailment, it would confer a blessing upon the American people as great as the valuable surveys of Hayden and Wheeler, which have contributed so much to our knowledge and mental culture; and, in an economic point of view, would aid the national interests by keeping in our land the multitudes of our countrymen who seek for health in the better-known resorts of Europe and Africa.

The information obtained by correct scientific investigation of the climate, springs and physical geography of different parts of our country, with reference to health, if placed within the reach of all classes, would exempt invalids from the vast expense often incurred in trying the curative powers of one sanitarium after another, in search of the place best adapted to the cure of each individual case, as well as prevent that positive harm which disappointing changes always work upon disease.

Furthermore, the education of the masses in the best way of preserving health and life, would prevent devastating epidemics, and it would be followed by boundless rewards in added national prosperity and security, for in health there is wealth and contentment. Congress should take the lead in a work of such magnitude and importance.

We live, when in health, as though old age were our only destiny, yet few there be who reach that goal. Disease comes upon most of us unawares. It is while in healthful vigor that we should prepare for future probabilities.

That inorganic material is lifted into the air in impalpable particles, and through this medium gains access to the human body, is a fact which has long been made apparent by the diseases of stone cutters and artisans in ores and metallic compounds containing lead, copper, arsenic, etc.

The dust from the surface of the earth, which is wafted about by the winds, is harmful only so far as it contains organic matter. That which is lifted from the streets of large towns, which are the receptacles of sweepings, expectorations and other waste animal and vegetable matter, may be pregnant with disease; but the dust raised from the fields and clean places has, in my opinion, some therapeutic value. Whilst serving at HiltonHead, S. C., in 1862, the air was often filled with clouds of the fine sand of which the Sea Islands are composed. During these sand-storms, and for a day or two thereafter, those suffering with bronchitis, and perhaps diseases of the lungs, expectorated freely. This was followed by a recovery, or by great amelioration of the malady.

In the early days of Colorado, the consumptives who came across the plains from the Missouri river to the Rocky mountains in wagon trains, were usually compelled to breathe much dust raised by the prairie winds and by the movements of the train. That the stimulating and antiseptic effect of this dust was an important factor in the relief that so many received during the transit, I have but little doubt. It was only nature's way of employing the "earth treatment," which is so popular with many surgeons.

The air within dwellings cannot, under the best hygienic management, be kept as pure as the external air. Ozone, the great purifier of the atmosphere, is itself destroyed in its oxidation of the specific poisons and odors of decay, and rarely gains entrance to dwellings (unless artificially generated there), and even if admitted, is consumed immediately by the impurities existing therein.

In the vitiation of the air of dwellings, the first and perhaps the most important of all causes, is respiration. In this process, oxygen is removed from the air, and carbonic acid is given back, while organic matter and watery vapor are evolved.

Dr. George Wilson, medical officer of health for the Mid-Warwickshire sanitary district, says:

> The organic matter given off has never been accurately determined. It has a very fœtid smell, and is but slowly oxidized. It is believed to be molecular, and may be said to hang about a room like clouds of tobacco smoke, and like tobacco smoke, the odor is difficult to be got rid of, even after free ventilation has been resorted to. It darkens sulphuric acid and discolors solutions of potassium permangenate. When drawn through pure water it renders it very offensive. It is certainly nitrogenous, and probably in combination with water, because nygrosopic substances absorb it most readily. According to Lemaire, Trautman and others, it contains minute cellular bodies, named 'putrefaction cells,' which have been found to bear a close resemblance to the so-called bacteriform puncta which Dr. Macdonald, of Netley, has detected in foul water. In sick rooms it is associated with pus cells and other emanations of disease. As much as 46 per cent. of organic matter has been found in plaster taken from the walls of a hospital ward in Paris.

He further says:

> Indeed, it is admitted by all physiologists, that the re-breathing of fœtid matter thrown off by the skin and lungs, produces a kind of putrescence in the blood, in proportion to the amount inhaled, and to the amount of exposure to its influences.

These conditions of blood may not only be recognized in headache, loss of appetite and lassitude, but they represent a state of the body which is susceptible to attacks of disease of a violent and fatal character; or the poison so gained may induce jail or typhus fever.

Another great source of air pollution in dwellings lies in imperfect house drainage; bad traps, leakages in waste and soil pipes, poorly ventilated drains, cess-pools and sewers, are the more common causes of such impurities. The effluvia thus gaining access to residences is productive, in its milder degree, of headache, nausea and sore throat, and, in its intensified form, of typhoid fever, diphtheria, dysentery and other of the zymoses. Though the foregoing represent the two great sources of air contagion in buildings, the gases which arise from damp and ill-ventilated cellars, steam from the laundry, and emanations from decaying vegetables, filthy floors and unaired beds, should not be overlooked, for in any of these there may be the excitant of the maladies just mentioned.

Residences and audience rooms in which ventilation has been fairly provided for, may by overcrowding become fruitful sources of disease;

as, for instance, a house sufficiently large and well-ventilated to accommodate with safety six persons, with the attendant exhalation from the body and lungs, and such other emanations as may proceed from the culinary and sleeping apartments, would become unhealthy if occupied by twelve persons. Not less than one thousand cubic feet of space should be allowed in dwelling houses for each occupant, for a less space will not admit of safe ventilation. In lecture rooms and churches a less number of cubic feet for each individual, possibly three hundred, may suffice, providing the building is occupied but an hour or two, and has previously been well aired. There is nothing which so stupefies the intellect and depresses the vital forces as rebreathed air. Many an eloquent sermon, many a brilliant lecture has for this reason, fallen unappreciated upon its hearers, and for like cause many a costly entertainment which would otherwise have been cheerful and sparkling with wit, has been made oppressively dull.

In the construction and ventilation of the school room, where mental culture and physical strength should progress evenly, the greatest care ought to be exercised, so as to allow for each pupil not less than three hundred cubic feet of space. To place a child day after day in one of the narrow, ill-ventilated school rooms of the present time, in which it is continually compelled to breathe impure air, permanently dulls the impressibility of the intellect and weakens the constitution, even if it does not induce immediate disease.

It has been ascertained by chemical tests and experiments, that the amount of pure air necessary for health and the perfect aeration of the blood in adult life, is 3,000 cubic feet for every hour of life. The air of an apartment containing 2,000 cubic feet, and occupied by four persons during the space of an hour, should be thoroughly changed six times. Less change than this causes a sense of closeness, and continued closeness in the room is soon intensified into offensive odors.

In ancient times, "a wise man built his house upon a rock;" in modern times, a wise man builds his house upon soil that has not been saturated with the seepage of filth, and so constructs it that the external air has free circulation within it, and its drains are so arranged as not to permit the entrance into it of death-bearing effluvia. In wisdom of this kind there is health for himself and for his family; from ignorance in these matters, there may result sickness and early death, with untold wretchedness and woe. And he who in the midst of a civilized community is to-day totally ignorant upon these matters, is *willfully* so, and voluntarily "sitteth in darkness, and walketh *in the shadow of* death." For beyond and above all the hygienic information that is now thrown broadcast among the people, are the teachings of nature herself in this all-important field. If we do but notice the methods employed by her for the destruction of those attributes of waste matter which are injurious to the higher animal life, they commend themselves very forcibly to our sense of the beautiful and grand, as well as to our gratitude for the wondrous wisdom with which they were planned. The diffusion of filth into running water causes its oxidation and consequent harmlessness. Its application in proper quantities to the soil of garden and field, causes neutralization of its virus by the antiseptic qualities of the earth, and it is next apparent in the increased richness of the verdure of vegetables and waving grains. If drawn into the air in vapors its fatality is destroyed by that subtle agent, ozone, which comes to us, like an angel of mercy, in the breath of flowers, in the spray of waterfalls, in showers and the friction of clouds.

To unite beauty with usefulness is a universal habit of nature; but the way also in which she proves that she abhors as heartily as she does a vacuum, the marring by man of her plans for his delight, as well as for his well-being, by dispersing all those evils of filth that she can affect, and, as quickly as possible, turning them into forms of beauty and utility again, is marvellous.

She cannot, however, in her reconstruction, keep pace with man's constant and rapid wrong-doing in this particular. If she could, there were no need of warning, of sanitary rules, of hygienic measures; but in what she can do she never wearies, so that we do not lack the assurance of a care ever active for our tastes as well as for our necessities.

While it is in my province to but briefly point out the dangers that come to us in the atmosphere, and some of the means by which such dangers may be avoided, the great end designed is to call the earnest attention of the people to this and other sources of disease; for education in hygiene must be general before its greatest good can be obtained.

We now stand upon the threshold of this vast field of labor, and the good that may be accomplished by our work in the prevention of sickness and death can be but imperfectly estimated. Not until man gives to hygiene the same attention that he does to his religion, shall we fully appreciate its benign influence. It is necessarily a part of Christianity, and is scarcely less important to the character of a true *Christian* than are virtue and morality.

Dirt in itself is ugly and repulsive, lacking each and every element of loveliness. Cleanliness is comely and winning, attracting as virtue does; while dirt, like vice, repels. "Cleanliness is akin to godliness," and in the light of being part of man's duty to himself, is an *essential* of godliness. And what godliness is in securing a man's spiritual welfare, such is obedience to hygienic principles in producing ability to enjoy the life that now is in the full measure appointed. As godliness is essential to the beauty, the strength, the richness of spiritual life, so is sanitary care to that of the physical existence.

It may be asked: "Why do *we* need so many more rules and precautions than did our grandfathers who enjoyed long lives without them?" But, how many of these long-lived grandfathers resided in cities amid all the dangers incident to crowded surroundings? And, is it certain that, if exposed to all the ills attendant upon such residence under non-hygienic rule, viz: lassitude, headache, dyspepsia, and various forms of blood-poison, they *enjoyed* their long lives?

No, the census tables of the past and present prove unerringly that advanced civilization promotes longevity, and as health brings its own incentives to usefulness, and as exemption from suffering and physical depression removes many of the causes for sins of omission and commission, there is every possible reason why we should at all times exercise all the care in our power for the application of that "ounce of prevention which is worth the pound of cure."

CRIMINAL ABORTION.

BY REV. ALEXANDER REED, D. D.

To the Colorado State Board of Health:

GENTLEMEN: In compliance with the request of your president—more than once renewed—I present a brief paper upon Fœticide.

I do so reluctantly, conscious of disqualification as a layman for discussing medical questions, and persuaded only by the following considerations:

First—This terrible and ever-increasing curse is *per se* more a question of *morals* than of *medicine*.

Second—There is abundant evidence that certain religious communions are comparatively exempt from it.

Third—Unquestionably a large proportion of this wide-spread evil is attributable to ignorance of its true character, and specially because on every hand—

Fourth—Urgent appeals are constantly made to members of our vocation to exert their influence to stay this fearful crime.

As an eminent physician in one of our largest eastern cities has published:

> The work of preventing the practice of the crime of abortion is with ministers of the gospel. It is because of its very nature and objects the special work of all Christian ministers.

Numerous quotations could be added on this point if necessary.

Now, if these propositions can be maintained, namely: That the destruction of unborn infants is a prevalent crime, reaching all classes of the community, and that it is fearfully increasing; that dense ignorance as to its nature and enormity abounds; that moral and religious influences have been the only influences that have restrained and limited it, as witnessed by statistics concerning certain creeds;

then, beyond all question, it becomes the manifest duty (however irksome) of every moral teacher to exert his influence to the utmost to arrest these red-handed, heedless, heartless slayers of innocent blood.

I.

THIS VILE AND NEFARIOUS CRIME ABOUNDS.

In New York in sixty years the ratio of still births has increased from 1 in 37 of the total mortality, to 1 in 10. To the question, asked in a circular letter to Philadelphia physicians, a few years since:

> Is it your opinion that abortions are on the increase in our community?

Every response was affirmative.

As one of the oldest and largest State Medical Societies reports:

> So vast, indeed, is now the practice of the crime and so universal is it that it finds its patrons and devotees not only in large cities, towns and hamlets, but in rural districts, and glories in embracing alike within its vast corrupting and murderous influence the ignorant and the educated, the vicious and the refined, the professors and non-professors of religion. So broad and vastly extended is the practice of criminal abortion, and so constant and persistent is its influence over nearly all classes of people, that it may be said to be now and for a great number of years past prevailing as a great universal, body-and-soul-defiling epidemic.

The eminent and venerated Professor Hugh L. Hodge, of the University of Pennsylvania, lately deceased, in a lecture upon this topic, says:

> Would that we could exonerate the *moderns* from guilt on this subject! It is, however, a mournful fact, which ought to be promulgated, that this crime, this mode of committing murder, is prevalent among the most intelligent, refined, moral, and Christian communities. We blush—he continues, while we record the fact that in this country, in our cities and towns, in this city, where literature, science, morality, and Christianity are supposed to have so much influence—even here, individuals, male and female, exist, who are continually imbruing their hands and consciences in the blood of unborn infants. This low estimate of the importance of fœtal life is by no means restricted to the ignorant, or the lower classes of society. Educated, refined and fashionable women—yea, in many instances women whose moral character is, in other respects, without reproach—mothers who are devoted, with an ardent and self-denying affection, to their children who already constitute their family, are perfectly indifferent respecting the fœtus in utero.

Fifty-nine physicians in one of our chief cities were asked:

> What proportion of your cases of abortion do you believe to have been criminally produced?

To this inquiry nineteen responded *one-half* of all their cases were willfully or criminally produced; twenty-one, that one-fourth; eleven, that a large majority; and another that seventy-five per cent. of his cases of abortion were criminally brought about. Seven failed to answer the inquiry.

> The united evidence, it may be said, of the profession—writes Dr. Nebinger, is not only that criminal abortion is extensively practised, but that the crime is rapidly marching on, gathering annually blood-stained recruits to its murderous ranks, and promising, by the boldness of its perpetration and its frequent production—if positive preventive means be not developed—to render itself defiant by the number of its devotees and the universality of its commission.

One hundred fold more testimony could be produced if necessary, but surely here is enough to demonstrate that this diabolical crime abounds on every hand, and flourishes, like the frogs of Egypt, in the bed-chamber of all classes of society. This fact is indisputable.

II.

INTENTIONAL MURDER OF THE UNBORN CHILD, AT ANY STAGE OF ITS EXISTENCE, IS NOTHING ELSE AND NOTHING LESS THAN MURDER.

Would to God this awful truth could be indellibly impressed upon the consciences of these sacrificers to Moloch who *defile* the *land!* But a false and fatal philosophy, derived from the ancients, has taught otherwise, and it is a herculean task to rectify an already perverted public conscience.

As Shakspeare makes King Henry IV say to his son and heir, in reply to the exclamation,

> "I never thought to hear you speak again."
> "*Thy wish* was father, Henry, to that thought."

So here; the votaries of pleasure, the selfish, the sinful *do not wish to be convinced that abortion is murder;* they will not abandon it so long as conscience can be silenced!

Says Beck in his medical jurisprudence:

> The ancients believed that the sentient and vital principle was not infused into the fœtus until some time after conception had taken place. According to Hippocrates, the male fœtus becomes animated at thirty days after conception; while the female required forty-two. The stoics believed that the soul was not united to the body before the act of respiration; consequently that the fœtus was inanimate during the whole period of utero-gestation. In times more modern, an error no less absurd, and attended with consequences equally injurious, has received the sanction not merely of popular belief, but even of *the laws* of many civilized countries."

But all such theories have perished in the bright light of later wisdom, *reason and science.*

We have nothing to do with the fables of Pagans, nor the the theories of Aristotle. Physiologists, physicians, learned divines and rabbis, all agree that the embryo is a living being *from the moment of its conception*, a creature in the state of progressive existence, as absolute *at and from the period of conception* as at any other period of its uterine or subsequent development.

Says Dr. Beck:

> Indeed, no other doctrine appears to be consonant with reason or physiology, but that which admits the embryo to possess vitality *from the very moment of conception.*

In the language of the admirable Percival:

> 'To extinguish the first spark of life is *a crime of the same nature*, both against our maker and society, *as to destroy an infant, a child or a man.*'

Wrote Bishop Fitzpatrick:

> The doctrine of the Catholic church, her canons, her pontifical constitutions, her theologians without exception, teach and constantly have taught, that the destruction of the human fœtus in the womb of the mother *at any period from the first instant of conception*, is a heinous crime, *equal, at least in guilt, to that of murder.* The very instant conception has taken place, here lies the vital germ of a man. No one can resist that development without resisting and annulling one of the most sacred and important laws established by the divine father of the Universe; and he is a criminal, a murderer, who deals an exterminating blow to that incipient man, and drives back into nothingness a being to whom God designed to give a living body and an immortal soul.

Says an eminent physician, quoted by Bishop Coxe:

> Murder is always murder, whether it consists in the destruction of the apparently formless *ovum*, or the full grown man. Suffice it to say here that no physiologists doubts at the present day, that the relations of the *ovum* an instant old to the immortal life of a newly created soul, are the same as those of a man who has reached the allotted three-score-years and ten, so far as the facts of the existence and individuality of the soul are concerned.

DO RELIGIOUS INFLUENCES RESTRAIN AND DIMINISH THIS CRIME?

This is a question delicate and difficult. There is conflict of opinion; allow me simply, briefly, to quote authorities.

Dr. David Gilbert writes:

> The teaching of Holy Writ on this subject (criminal abortion), *cannot be plainly and fully declared by all religious teachers.* It is—he continues—a fact well known to practitioners, that communing members of the Catholic and Isrælitish churches are not guilty of this crime. I have never met with a single case; but, on the other band, when accidental abortion was threatened, there was manifested the most intense anxiety that the fœtus might be saved. The inference may be fairly deduced—that *whenever willful abortion will be presented in its true character as a crime*, as in the case of the Catholic and Jew, *the people thus instructed will be duly influenced* just so far as they may be sincere in their *religious professions.*

Per contra. Dr. Thos. F. Rochester, of Buffalo, in a medical college address declares:

> This usage is not limited to any people, nor *is it avoided*, as has been stated, *by those of any creed.* Medical men know this. It is not an original *American fashion.* It is derived from that people who are fashion's chief votaries—who dethroned the God of the Bible and made adoration of a day to a painted creature miscalled reason. If we would exist as a nation, this generic suicide must be stopped. Let us not follow, but be warned by the example of France, WHOSE POPULATION IS STEADILY DECREASING, NOT FROM EMIGRATION, WAR OR PESTILENCE, BUT FROM UNNATURAL CAUSES—the death-rate exceeding the birth-rate by at least 50,000 per annum.

Dr. J. C. remarks (as quoted by Dr. Nebinger in the proceedings of the Medical Society of Pennsylvania, 1876):

> I have a practice which embraces, I may say, all religionists. It has struck me as a very remarkable peculiarity in the matter of abortions, that the greater number of those which I have attended spring up in Protestants, and have been the result of some wilful violence; that I have never treated a case in a *Catholic* or *Hebrew* which I believe to be willful; and further, that while in the instance of Protestants, with scarcely an exception, requests were never made to prevent the abortion from being consummated; in the instances of the Catholics I was implored to arrest the abortion, and much solicitude was manifested lest it should go on. I have naturally inferred that *there must be some special instruction* given by the Romanish and Jewish churches which has the effect of *largely preventing* the existence of the crime of abortion among their communicants.

Dr. A. S. (says Dr. Nebinger) remarks:

> The work of preventing the practice of the crime of abortion *is with ministers of the gospel.* There are none I know who are so correctly instructed by their ministers upon this matter as Catholic women; and I know also that they are very much more free from the vice of criminal abortion than other women; and this I say, while, by religious training, I am not in sympathy with those people.

Rev. Dr. John Todd wrote:

> There is nothing in Protestantism that connives at it (criminal abortion), but there is VAST IGNORANCE *as to the guilt* of the thing. But in the Catholic church human life is guarded at all stages by the confessional, by stern denouncement and fearful excommunication. The rule in the Catholic church is unbending.

Dr. H. R. Storer, of Boston, writes:

> It is not of course intended to imply that Protestantism, as such, in any way encourages, or indeed permits the practice of inducing abortion; *its tenets are uncompromisingly hostile to all crime.* So great, however, is THE POPULAR IGNORANCE *regarding this offense*, that an abstract morality is here comparatively powerless; our American women arrogate to themselves the settlement of what they consider, if doubtful, purely an ethical question, and there can be no doubt that the Romish ordinance has saved to the ruler many thousand infant lives.

But enough. I trust I have established to the conviction of every candid mind the points presented, namely:

(*a*) *That this* nefarious crime is wide-spread and increasing.

As a physician of eminence, quoted by Bishop Coxe, remarks:

> It is difficult to state how extensively practiced is this murderous habit. It would be safe to say, perhaps, that unborn generations have been lessened of late nearly one-half by criminal interference with the laws of nature.

(*b*) That the crime is murder.

(*c*) That profound ignorance prevails in regard to its true character; and finally,

(*d*) That the diffusion of knowledge and counsel concerning the accursed evil have, so far, accomplished much in the way of diminishing it.

I close because I have already reached the limits of an article for a state report. I possess material for a volume.

I have confined myself chiefly to the presentation of facts and statistics without adding argument. *They speak for themselves, and are unanswerable.* I leave them to the honest consideration of every reader of this report.

What then can be done?

Promulgate the truth in every legitimate way, far and wide, regardless of prudery or a false and fatal modesty. Arouse, enlighten, fortify the public conscience in the interests of truth, purity, morality and humanity.

Let this Society superintend petitioning our law makers to construct laws in accord with physiology, philosophy, and facts.

Let wise measures be devised for eradicating this infamous crime, usually so difficult to detect.

And may the blessing of the Creator of the helpless attend all your efforts.

REPORT

ON

ALTITUDE: ITS INFLUENCE ON HEALTH;

SUMMER IN THE MOUNTAINS.

BY W. EDMONDSON, M. D.

In all the settled portions of the mountain regions of Colorado, winter may be expected to continue until the month of June. But this long season is not severe when compared with the same latitude on the Atlantic coast. A large proportion of the days are mild and pleasant, and the occasional storms are neither characterized by extreme cold nor by heavy falls of snow. Clear and spring-like days often continue for weeks together, and the highways are frequently as dry and dusty as during mid-summer. The winter season may be regarded as the six months following the first of December; and the last two months of this half year are quite apt to be the most disagreeable of all, for the deepest snows come almost exclusively during April and May.

Spring is a season which in this climate cannot be said to exist, and the advent of summer is sudden; a few days being sufficient to change a dreary waste of snow-covered mountains to a pleasing and attractive landscape.

The climate is healthful at all times, but is more conspicuously so during the summer season than at any other time. Even in those localities where hygienic laws are so totally neglected that it seems a miracle a pestilence is not generated, the inhabitants as a rule, escape *the curse that they* appear to invite.

There are narrow ravines in the settlements of Gilpin county where the offal which has been accumulating for months is allowed to lie rotting in the sun of July. Indeed the gulch of three miles in length, along which the towns of Central and Black Hawk are built, is a vast open sewer into which the garbage—the vegetable and animal refuse of the entire community—finds it way, there to lie and generate and diffuse its pestilential gases until the accident of an autumn freshet carries it into the waters of Clear creek. But in spite of this the inhabitants pass through the months of June and July in a condition of good health which they have no reason to expect. During the early days of the settlement, when a large portion of the community lived in small, illy ventilated huts, covered with damp earth, and built partly under ground, there prevailed malignant fevers of a frightful mortality which received the name of "mountain fever," but later experience has proven that the pestilence so named bore no necessary relation to the mountains. It was simply the outgrowth of the unwholesome ways of life incident to a new mining camp, and disappeared with the causes that gave it origin.

As an illustration of the immunity from disease which is enjoyed at the present time, even under unfavorable circumstances, I will here cite the fact that up to the twentieth day of August of the present year—the date of this writing—I have not heard of a single case of cholera infantum in the county, and but one case of enteritis, and that one not fatal. This is the more remarkable when we consider that the very portions of the settlement which are the most unheathful are swarming with little children.

The subjoined is a list of every case, not surgical nor obstetrical, treated by me during the months of June and July, 1878:

	Cases.
Mild diarrhœa of infants during dentition unaccompanied with fever	4
Mild diarrhœa of infants during dentition accompanied with fever	2
Convulsions during dentition	1
Dysentery (both adults)	2
Congestion of the lungs (adult)	1
Divers trifling ailments of children	5

The case of congestion of the lungs was the only one of the above list that terminated fatally.

Of climatic causes that tend to generate disease in the Rocky mountains during the summer months there would seem to be absolutely none. The atmosphere is purity itself. There are no miasmata that I ever heard of. The nights are pleasantly cool and the days are only moderately warm. The following thermometric report, for the last week of July of the current year, at Central, may be taken as fairly representing the temperature of the entire summer:

	6 A. M.	12 M.	10 P. M.
1878.			
July 23	60°	73°	58°
July 24	60	68	55
July 25	60	68	60
July 26	52	65	50
July 27	53	70	57
July 28	60	72	60
July 29	58	70	58
July 30	60	80	60
July 31	60	80	65

The showers are frequent and refreshing, and almost daily there are floating clouds which prevent the constant glare of the sun at mid-day. Violent wind storms during the summer season are unknown. The breezes are generally from the west, blowing down from the snowy range. The air is always dry and generally charged with electricity to a remarkable degree. Almost every portion of the mountains, below an altitude of 10,000 feet, is covered with forests of pine and fir; and the resinous odor from these forests may possibly add to the natural salubrity of the climate.

When children suffering from cholera infantum, enteritis and other kindred diseases, come up into the mountains from Denver and other localities, the result is almost always favorable. This is a phase of the health-restoring properties of this climate that has not attracted as much attention as it deserves, and yet it is not second in importance to any. Much has been said of the benefit to sufferers from asthma, bronchitis and prostration from all causes, which has been experienced by many coming here, but the little patients whose lives have been saved by a summer residence in the mountains have been comparatively overlooked. Leading physicians of Denver inform me that they habitually send infantile patients to Idaho Springs, Georgetown and other mountain towns during the summer heats, and with the *very best success.* Every part of the mountains is now so easy of access that almost any one who wishes to avail himself of their advantages, for the sake of his children, can do so. There seems to be little choice as to locality, but it would be well to bear in mind that certain portions of Central and Black Hawk, for reasons mentioned above, ought to be avoided. The same precaution no doubt applies to other towns, for every settlement has probably its relatively favorable and unfavorable localities. Happily the very months in which the mountains wear the most favorable aspect that they are ever permitted to assume, are the months of maximum healthfulness, so that the mere tourist and pleasure seeker has often an additional incentive to visit these regions.

Whether the character of these elevated districts in regard to the subjects we have been considering, will always remain as it now is, we have no means of knowing. The mountains are so vast, and the number of inhabitants are and will always remain so comparatively few, that it does not seem probable that the climate will ever change through human agency. It is far more likely that they will remain as now for hundreds of years to come—a resort of ever increasing popularity for the tourist ; and for the seeker after health.

W. EDMUNDSON, M. D.

REPORT

ON THE

MINERAL SPRINGS OF COLORADO.

BY DR. T. G. HORN.

Our mineral springs are becoming more and more important as the state becomes more developed and settled, and to-day are only second in value to the immense wealth of our mountain district. No state in the Union contains so many springs, and springs of such extraordinary medicinal virtue as Colorado; they are distributed over so large a portion of the state as to offer great variety in locality, altitude and climate, thus affording advantages for every class of invalids suffering from any disease common to this country.

Railroads penetrating the mountains at several points, have made the springs more easy of access.

The Denver & Rio Grande Railway company has accomplished one of the grandest feats known in American engineering, by carrying its road successfully over the range at Veta Pass, thus bringing our southern springs within the reach of all classes of visitors; of the tourist who comes for pleasure and recreation, and of the invalid who comes for the permanent restoration of a debilitated constitution.

In my first report I closed with but a reference to the springs near Ouray, owing to ignorance of their locality and medicinal quality. Finding it impossible to make a correct and impartial statement of the virtue, locality and general medicinal quality of the numerous mineral springs on the western and southern slopes of the range, without a personal visit, I determined to make it. Leaving Colorado Springs near the middle of August, I reached Ouray on the twenty-seventh of *August, 1877.*

OURAY.

This is a new town of great promise, situated at the forks of the Uncompahgre river and Cañon creek, about nine miles east of the Uncompahgre park; in a beautiful valley, surrounded on all sides by lofty mountains; population about one thousand; altitude 7,300 feet. Accessible by road from Lake City, eighty miles, and by mountain trail, thirty-five miles. Mail once a week, but both road and mail facilities will be much improved during the fall and winter. A very healthy locality; there having been but little sickness of any kind since the town was laid out. Here we find quite a number of mineral springs. Directly east and adjoining the town site, the foot-hills rise abruptly to an elevation of from forty to sixty feet above the city. From their base, at different points, issue nine mineral springs—six hot, two cold, and one sulphur—varying in temperature and medicinal constituents.

HOT SPRINGS.

For the purpose of better describing these springs we will number them one, two, three, four, five and six.

Numbers one and two are near to, and on the left of one of the streets running east and west through the town. Mr. Oldwider, the proprietor and owner of the springs, has built a neat house some thirty feet from springs numbered one and two, and, by closed troughs, conducts the water of each spring into the bath house with a fall of twenty feet, giving both plunge and shower baths. No quantative analysis of any of these springs has as yet been made, but the carbonates abound, with that of lime in excess. Temperature of number one, at the fountain, 138° F., and that of number two, 134° F. These two springs come bubbling up within ten feet of each other—strong, clear streams of water, giving off carbonic acid gas in small quantities; taste pleasant, when allowed to cool. Nos. 3, 4, 5 and 6, differ but little in any respect from the first, except in temperature, varying from 120° to 130° F. No. 7, in a direct western course, and about fifty yards from the bath house, is a cool spring, slightly impregnated with sulphur, very pleasant to the taste, and differs from the others in medicinal qualities as well as in temperature. These springs are of easy access, and can be readily utilized. They will, without doubt, prove very beneficial to all chronic forms of gastric trouble.

SULPHUR SPRINGS.

About one hundred yards east from the bath house, and much higher, we have a hot sulphur spring, very similar to the justly celebrated springs of Middle Park. Stream, strong and clear; gasses, carbonic and sulphureted hydrogen; temperature, 134° F.; no quantative analysis.

CAÑON CREEK SPRINGS.

Along the west bank of this beautiful, rapid stream, are three valuable springs. The first, about one hundred yards from the mouth of the creek, is a warm *chalybeate* spring, temperature 136° F. About one hundred and fifty yards farther up we have another hot spring, containing the *bitter salts* in such large quantities, that a small glass of water acts as a quick cathartic; temperature 130° F.; bitter, unpleasant taste; lately discovered. But a short distance, perhaps one rod, up the stream, we have a hot soda spring. This is a large body of water, and comes rushing out from under an immense rock, almost at a level with the surface of the creek at low water; temperature 158° F.; free carbonic acid gas in excess. Unfortunately, these fine springs are so near the bed of the creek that they are frequently overflowed by the stream; but their valuable medicinal qualities will amply pay the owners for properly preparing them for internal and external use.

SULPHUR SPRING NO. 2.

On the north side of the town site and but a short distance from the principal hotel, we have another mineral spring, owned by W. J. Buchanan, Esq., temperature 90° F., very palatable; pleasantly located; gasses, carbonic and sulphureted hydrogen.

The owners are now aware of the beneficial effect of these mineral waters, and are having them put into proper shape for use, and correct analyses made. Enough is now known from their use to recommend them highly for rheumatism, gastric troubles and all forms of skin disease.

SCENERY.

The scenery about Ouray is very attractive. The cañon through which Cañon creek flows, is well worth a visit to that country. The mines are numerous and rich in mineral, silver being the most common production.

OURAY MINERAL SPRINGS.

Nine miles in a north-west course, and down the Uncompahgre river, lies the Uncompahgre park, a fertile piece of bottom land which, when properly cultivated, produces small grain and vegetables in great quantity. Near the center, on the east side, rises the famous Ouray spring of the Indian Nation. The main spring is within an inclosure or basin (formed principally of the deposit from the water) eight feet wide, ten feet long, and from fifteen to twenty feet deep, the outlet being under this crust or deposit, which consists chiefly of the carbonates of magnesia and lime, and covers several acres. The stream is traceable by holes through which the steam rises in a great number of places. The temperature in the main spring is 140°, and ranges from 120° to 130° at different points from whence it issues. No analysis has been made, but the chief constituent of the spring is sulphate of soda. A number of holes have been dug by the Indians and travelers near the streams, and the water conducted into them for bathing purposes. We could get no reliable account of the use the Indians made of them, or for what particular disease, but they held them in great reverence and veneration. Further down the river, and in the valley proper, are other springs of much the same quality, but *cold*, and in taste very similar to the Navajo at Manitou.

IRON LAKE.

This natural curiosity, known as Iron lake, is situated near "Silverton pass," on the road leading from Silverton, a short distance below the summit, on the side of the mountain. Circular in form, seventy-five feet in diameter, and from ten to twenty feet deep, the water is clear as crystal, very cold, with strong chalybeate taste. Parties living in that mining region speak highly of its appetizing and tonic effect when used internally. No analysis has been made, but a dark red deposit that has accumulated some distance below, shows plainly its ferruginous character.

WARM AND COLD SPRINGS OF THE ANIMAS VALLEY.

This beautiful garden spot of our mountainous region needs more than a passing notice. Going south from Silverton by a good wagon road along the Animas river about thirty miles, we enter a lovely open park known as the Animas valley. This valley is nearly fifteen miles long and will average one and a half miles wide. The Animas river, a clear, pure stream of water, passes through it. On either side are fine farms, well cultivated, producing large crops of corn, wheat, rye, oats, and in fact all kinds of produce usually raised in a good farming country in any state, and inferior to none. The mountains rise gradually on both sides, and are thickly covered with the best of timber. The altitude being some 3,000 feet lower than Silverton, makes the valley much warmer, and gives it consequently a more pleasant winter; and, with the valuable mineral springs in this locality, it must soon become a place of great resort for invalids.

Near the old town site of Elbert, at the head of this fertile valley, are the *iron springs* owned by J. H. Pinkerton, Esq., three in number, much the same in quality, taste and deposit—this being of a red-brown color, containing carbonate of lime, magnesia and iron. The springs are on top of the foot hills, some 400 feet above the road on the west side, and are very similar in taste to the "Iron Chief," of Manitou; temperature about 90°. Some three hundred yards further down, and much more accessible and more beautiful in location,—the plateau around the point from whence the spring issues being level and covered with a beautiful foliage of small timber,—we have a remarkable *mineral spring*, violently agitated by the escaping carbonic acid gas, issuing with great force, and a noise resembling the escaping of steam from an engine, which can be heard at quite a distance. The stream is large and rapid. About ten feet from point of issue, Mr. Pinkerton cut out a bathing place from the solid deposit of the water, six by ten feet and three feet deep. Over this is a neat log house twelve by eighteen feet. The water runs directly through this bath tub. The temperature being about 90° F., and the current rapid, it offers a convenient and very pleasant medicinal bath. This spring is a great curiosity and will prove of untold value to debilitated constitutions. Judge P. assured us that already many who have used this water regularly and properly, have derived positive benefit therefrom. No quantative analysis has yet been made. Gas, free carbonic acid; deposit, lime and magnesia.

SODA SPRINGS.

Two miles from the hot springs, down the river, we find a cold soda spring, owned by Seth Sockett, Esq. This is a large body of water springing directly up on the level bottom land, about one hundred *feet to the left of* the road, enjoying quite a reputation in the neighborhood for its refreshing taste and medicinal quality; no quantative analysis; gas, carbonic acid.

ANIMAS CITY.

This is a new, flourishing town, of about three hundred inhabitants, situated at the crossing of the Animas valley road with the road leading from Parrott City to the Pagosa springs, and at the southern entrance of the beautiful valley above described. Near this village are large coal deposits of a superior quality, and well adapted to smelting ores. This, with the magnificent timber with which this country abounds, and the best of water power, furnish excellent advantages for the location of machinery with which to manipulate the large amount of rich ores mined at Silverton. From this place to the Pagosa springs, we travel nearly due east. The road is good, and passes through a low, rolling, well watered, beautiful country, covered with a most luxurant growth of gramma grass, well adapted to grazing for both sheep and cattle.

PAGOSA SPRINGS.

These far-famed and most justly celebrated mineral springs, are situated on the south side of the San Juan river, about twenty-five miles from its head waters, on the road leading from Garland, by way of Conejos, to Animas City. This is a good road and crosses the range at a low pass, through which the railroad will soon be built. The main spring is at the upper part of the basin, and about two hundred feet from the river. This spring is within an inclosure nearly seventy feet long, fifty feet wide, and forty feet deep. The deposit consists chiefly of carbonate of lime, and covers a large portion of the basin around in all directions. The principal outlet is by an underground channel running north, which can easily be followed by the steam rising through the holes and crevices of the deposit. There are four other hot springs at different points, ranging from two hundred to five hundred feet from the main spring; temperature of the main spring, 140° F.

By referring to Prof. Wheeler's report, part VI, volume III, page 627, we find as follows:

> The waters of four of these springs were subjected to analysis, and proved to be very similar in their composition. The chief constituent of these springs is sulphate of soda. *The analysis* resulted as follows: In hundred thousand parts are contained parts as follows *(No. 1, main spring)*:

CONSTITUENTS.	No. 1.	No. 2.	No. 3.	No. 4.
Sodium carbonate	4.70	3.33	....	....
Lithium carbonate	0.71	Trace.	Trace.	Trace.
Calcium carbonate	59.00	59.50	54.51	58.73
Magnesium carbonate	4.85	3.92	3.68	3.59
Potassium sulphate	7.13	6.98	6.63	7.10
Sodium sulphate	221.66	220.20	223.92	224.59
Sodium chloride	29.25	29.36	31.21	29.81
Silicic acid	5.70	5.21	5.53	3.82
Organic matter	Trace.	Trace.	Trace.	Trace.
Total solid constituents	333.00	328.50	325.48	327.64

Gases: carbonic acid, hydrogen sulphide.

About one-half mile below the main spring we find a cold spring much the same in medicinal qualities and very pleasant to the taste.

SCENERY, ETC.

A short, pleasant drive brings us to the mountains, replete with grandeur equal to that of many of our most beautiful and more frequented places of resort. Bear, elk, deer, mountain sheep, and all kinds of wild game are abundant. The streams abound in trout and other fish. The lay of the country is advantageous both for farming and grazing, being on the southern slope of the range, with an altitude of 7,084. The winters are mild and free from severe storms. The river bottom land is rich and very productive, and will no doubt make quite an agricultural country. The inducements for a railroad are so great, and access so easy, that I am confident this country will soon be opened for settlement, with railroad connections both east and west, giving to the world these valuable mineral springs.

PARNASSUS SPRINGS.

These springs, five in number, are situated twelve miles southwest of Pueblo, near the head of Red creek, a tributary of the Arkansas, in the northwest foothills of the Greenhorn mountains. Some of them differ in temperature and medicinal constituents. One spring of plain water, with a temperature of 52° F., is quite a contrast with the five mineral springs, and all within a short distance of each other. (See *Lieutenant* Wheeler's report, part 6, vol. 3, page 620).

No. 1, a small bubbling spring; temperature, 66° F. No. 2, a large spring of about six feet square; 72° F. No. 3 and 4 closely resemble No. 2; temperature, 71° F. No. 5, containing besides saline constituents, sulphurated hydrogen; temperature, 59° F.

In one hundred thousand parts are contained as follows:

CONSTITUENTS.	No. 1.	No. 2.	No. 5.
Sodium carbonate	126.04	118.45	73.32
Lithium carbonate	trace	1.78	0.15
Calcium carbonate	71.00	54.54	46.91
Magnesium carbonate		22.43	17.03
Iron carbonate	1.54	2.23	2.75
Potassium sulphate	19.22	18.44	14.45
Sodium sulphate	8,78	3.98	3.28
Sodium chloride	102.96	104.13	53.23
Silicic acid	4.21	7.94	6.00
Organic matter	trace	trace	. . . . .
Total solid constituents	333.75	333.92	217.21

Sulphureted hydrogen, trace. Carbonic acid in excess.

The water in all these springs is very pleasant to the taste. Mr. C. Thatcher, the owner, has made some improvements for the accommodation of invalids, and already there have been quite a number who have tried these springs with marked benefits, especially in gastric troubles. The foothills are well timbered, and altogether the location is a pleasant one, and an easy drive, over a good road, from Pueblo.

CARLISLE SPRING.

This spring is situated on the banks of the Arkansas river, twenty miles above Pueblo, having its origin in beds of cretaceous age. A deposit from this spring formed in thickness of from six to seven feet, overhangs the rocky banks of the river, and is composed chiefly of carbonate of lime, and magnesia, with a small portion of iron.

Lieutenant Wheeler, in the report referred to, says of this spring:

> Carlisle spring yields about eight gallons of water per minute; has a surface of about five square feet; and is 65° F. temperature (July 15). The temperature of the air at the time being 76° F.

The water is clear, of agreeable taste, and deposits a red sediment. After concentration, an alkaline reaction can be observed. A similar spring is found six miles south from Cañon City, on the Rosita road.

Analysis of the Carlisle spring: In one hundred thousand parts of spring water are contained parts as follows:

Constituents.	
Sodium carbonate	15.42
Calcium carbonate	38.40
Magnesium carbonate	19.52
Iron carbonate	0.51
Potassium sulphate	1.20
Sodium sulphate	34.28
Sodium chloride	19.30
Silicic acid	Trace
Organic matter	Trace
Total constituents	128.63

Gas: carbonic acid.

This spring is near the road leading from Pueblo to Cañon City, pleasantly located in a low altitude, and offers many advantages to the debilitated, weak constitution, and, with comfortable accommodations, would make a pleasant and profitable winter home for the consumptive.

ANTELOPE SPRINGS.

Some eighteen miles northwest from the Liberty springs, or Wagon Wheel gap, at the junction of the Lake City and Silverton stage roads, we find the sulphur springs, known as the Antelope springs. Mr. Geo. S. Alden, the owner and proprietor, is improving this place and will soon have the springs in a condition to be properly used. The largest spring is a warm sulphur spring. Temperature 90°. Gases, sulphureted hydrogen and carbonic acid. No quantative analysis. The second, situated some seventy-five feet east of the first spring, is cold and purely a soda spring, with pleasant, refreshing taste, small stream, giving off carbonic acid gas in small quantities. These springs will soon be in a condition to be used, and will be of great value to the vast number of all classes of people who travel those roads in the summer season.

THE HEYWOOD HOT SPRINGS.

These medicinal springs, three in number, are situated on Chalk creek, Lake county, about five miles from the mouth of the creek, and near the proposed line of the A., T. & S. F. R. R. to Leadville. No quantative analysis has been made, but enough is known of their curative qualities to cause them to be widely renowned, and many persons suffering from rheumatism, neuralgia and debilitated constitutions have found relief from the proper use of these waters. Temperature

128° F. Taste, pleasant when allowed to cool. Scenery unsurpassed in Colorado. Game in abundance. Fishing and hunting good. The streams abound with trout and other fish, and the mountains are alive with bear, elk, deer, sheep, and small game. Mr. D. H. Heywood, the proprietor and owner, is improving the place rapidly, and can now accommodate a few families with comfortable rooms and good board. Parties who visit that part of our state should not fail to stop at this beautiful place, and get the benefit of those valuable medicinal springs.

DENVER.

The metropolis is beautiful in its natural surroundings, made more so by the taste shown by her people in taking advantage of the natural resources, until a more lovely place is hard to find in the western states; being well supplied with all late inventions for safety, health and prosperity, it gives to all who choose to visit this city for any purpose, a feeling of security, that at once banishes all fear, and causes the stranger to feel at home in every sense of the word. And, in addition to other facilities for the protection and restoration of health, it is not without one of nature's own medicinal fountains, known as

PORTER'S SULPHO-CHALYBEATE SPRING.

This spring, containing both cathartic and tonic properties, is situated in a favored locality, with its facilities for use appropriately planned by the proprietor, with beautiful surroundings, within reach of the best market and the best hotel accommodations in the west. Invalids suffering from skin diseases, or from pure debility produced by any cause, should give these springs a fair trial.

Analysis made by the Colorado School of Mines, and published in their circular of 1875–76, on page 27, is as follows :

One pint contains—	*Grains.*
Carbonate of lime	1.285
Carbonate of magnesia	.125
Chloride of magnesium	.143
Chloride of sodium	.666
Sulphate of soda	3.433
Carbonate of soda	.727
Sulphide of sodium	.238
Silicate of soda	.112
Sulphate of potash	.038
Iron oxide	.187
Total	6,954
Ammonia	Trace
Free sulphureted hydrogen (cubic inches)	.276
Free carbonic acid (cubic inches)	.433

There are quite a number of mineral springs in this State of which I have simply heard, but have not information sufficient to report them. The beautiful park known as Estes park, contain such springs.

Analysis of the South Park sulphur springs, made by Prof. George E. Patrick, of the Kansas State University, Lawrence, Kausas. The contents of the water per *litre* are in *grammes* as follows :

Contents per litre.	*Grammes.*
Sodium chloride	1.6561
Potassium chloride	.3270
Sodium sulphide	.0973
Sodium carbonate	1.3101
Calcium bi-carbonate	.3233
Magnesium bi-carbonate	.1934
Alumina	.0066
Silica	.0093
In one litre of water	3.9231

Sulphur and organic matter not determined for lack of material.

Solid residue from evaporation of one litre . . . 3.7173

Gas ; sulphureted hydrogen.

Analysis of the mineral springs at Wagon Wheel gap : Report of Lieutenant George M. Wheeler, corps of engineers United States army, page 623, part 6, volume III. In one hundred thousand parts of the water of the springs of Wagon Wheel gap, are contained parts as follows :

CONSTITUENTS.	No. 1.	No. 2.	No 3.
Sodium carbonate	69.42	trace	144.50
Lithium carbonate*	trace	trace	trace
Calcium carbonate	13.08	31.00	22.42
Magnesium carbonate	10.91	5.10	
Potassium sulphate	trace	trace	trace
Sodium sulphate	23.73	10.50	13.76
Sodium chloride	29.75	11.72	33.34
Silicic acid	5.73	1.07	4.75
Organic matter	trace	trace	. . . . .
Sulphureted hydrogen	trace	12.00	. . . . .
Total	152.12	71.39	218.77

* The lithia was present in such quantity that I could have determined it had a gallon of the spring water been collected.

SELTZER SPRING

In the mountains at Springdale, nine miles from Boulder, deserves mention. It has good accommodations, is easy of access, pleasantly situated, and well worthy the attention of the tourist and invalid. Being situated in the Tellurium belt and close to famous mines, its surroundings are of interest. Its waters are highly charged with free *carbonic acid and* are aperient to some, with action upon the kidneys; *as an alterative they* are valuable, besides being a pleasant drink.

A TABLE OF THE CONSTITUENTS

OF SOME OF THE

MINERAL SPRINGS OF COLORADO, TO ACCOMPANY THE 1876 AND 1877 REPORT OF DR. T. G. HORN, MEMBER OF THE STATE BOARD OF HEALTH, (COMPILED BY THE SECRETARY OF THE BOARD.)

Name of spring.	Tonic Iron springs.	Seltzer spring.	Hot Bath Sulphur spring, No. 6.	Hot springs.	Sulpho-Chalbyeate.	Navajoe spring	Shoshone spring.	Ute spring.	South Park Suphur spring.	Hot spring.	Iron Duke spring.	Carlisle spring.	Parnassus spring, No. 5.	Hot spring, No. 2.	Pagosa spring, No. 1.
Location.	Estes Park, Larimer county.	Springdale, Boulder county.	Middle Park, Grand county.	Idaho, Clear Creek county.	Denver, Arapahoe county.	Manitou, El Paso county			South Park, Park county.	Canon City, Fremont county.		Near Pueblo, Pueblo county.		Wagon Wheel Gap, Hinsdale county.	Conejos county.
Temperature, Fahr	50°	40°	117°	110°	60°	50°	48°	44°	140°	102°	51°	65°	59°	148°	140°
Constituents	Grains.	Grains.	Grains.	Grains	Grains	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.
Soda carbonate			22.40	30.80	5.81	78.56	51.79	34.61	76.53	73.20	76.80	8.99	42.76	Trace.	2.74
Soda bicarbonate		5.46													
Soda sulphate		107.60	25.10	29.36	27 50	10.74	21.62	18.00		79.30	12.20	19.99	1.91	6.12	129.29
Soda silicate		4.00		4.08	0.89										
Sodium chloride	0.95	4.96	13.11	4.16	5.32	23.20	24.56	18.42	96.89	18.20	83.00	11.25	31.04	6.84	17.06
Sodium iodide		1.30													

Sodium sulphide					1 90				5.68						
Potassa sulphate	0.72		1 69		0.30	9.45	2.98	4.08				0.69	8.43	Trace	4.15
Potassium chloride									19 10						
Lithia carbonate						0 14	Trace.	Trace.		Trace.	Trace.		0.09	Present	0.41
Lime carbonate	2.08		6.42	9.52	10.28	79.47	63.28	34.43		33.50	33.00	22.39	27.42	18.08	34.41
Lime bicarbonate		43.30							18.88						
Lime sulphate				3.44											
Magnesia carbonate	1.53			2.88	1.00	18.46		8.50		12.80	14.60	11.38	9.93	2.97	2.82
Magnesia bicarbonate		0.66							11 29						
Magnesia sulphate				18.72											
Magnesium chloride				Trace.	1.14										
Iron carbonate	4.86		Trace.	4.12				3.37			Trace.	0.29	1.60		
Iron bicarbonate		4.00													
Iron oxide					1.49										
Ammonia			Trace.		Trace.										
Lithia			Trace.												
Alumina									0.38						
Silica	0.58		1.36			0.85	Trace.	1.56	0.54			Trace.	3.49	0.62	3.32
Gases, free carbonic acid		Excess	Present	Excess	Excess	Present	Present	Present				Present	Excess		Excess.
Gases, hydrogen sulphide					Excess				Present				Trace.	Excess	Trace.
Organic matter	1.31											Trace.			Trace.
Total solids (in grs. per wine gal.)	12.03	171.28	70.08	107.08	55.63	220.87	164.23	122.97	229.29	217.00	219.60	74.98	126.67	34.63	194.20

For detailed information of each spring or group of springs, see the reports.

REPORT

ON

ILLUMINATING OILS.

BY CHARLES AMBROOK, M. D.

Your committee, to whom was referred the subject of Illuminating Oils, would respectfully report that it has given the question a careful consideration, and finds that it has been so thoroughly investigated by other boards, notably so by the New York City and Michigan State Boards of Health; the history of whose struggle with the petroleum refiners makes a curious and interesting chapter in the annals of fraud,—that but little remains to be done except to apply the experience of those Boards in bettering our condition.

So far as oil for illuminating purposes to be used in lamps is concerned, we are practically limited to petroleum products, and of these kerosene is or ought to be the only one used. Any other addition is an adulteration, and to such are we to look as the source of a vast majority of kerosene accidents. Kerosene is a product of rock oil distilled at a temperature commencing at 300° F. and ending at 400° F. This 100 degrees is a wide range of temperature.

Granting that kerosene is distilled at its proper range of temperature, it is evident that there is ample room for grading it; and this grading can be done in three ways, by specific gravity bottle, an hydrometer, or flash test. The first two require delicate apparatus and skill, as one degree of temperature of the oil being tested with an hydrometer or specific gravity bottle will make several degrees difference in the flash test, which is the most practical one for our purpose. Therefore this is the test that is now being generally adopted, because it is found to be the simplest and the most delicate, considering the apparatus used, and is as follows: Oil is heated by a water bath and a burning taper applied close to the surface, and at whatever temperature a faint snapping flash or blue flame occurs, that degree is the flash test, which in Michigan must be over 140° F. Other states have laws upon the subject, but I am not aware of the tests they at this date, require. That of the United States is 110° F.

In distilling or refining kerosene oil any grade can be made that the market calls for, from an oil with any flash point desired, burning out quickly with a dull yellow light, encrusting the wick, smoking easily, leaving behind a dirty sediment in the lamp; and in burning generates a great amount of heat, which being conducted downward by the wick tube into the oil reservoir increases the danger of explosion. To an oil clear as water, burning without incrustation of the wick, with a large white flame, without smoking easily, no inflammable vapors given off at a temperature of 150° F., less heat at the burner, and for domestic use absolutely safe; and without either naptha or benzine to give off dangerous vapors, and paraffine to cover up their presence, giving it a humbug flash point in order to comply with the letter of the law, and evade the spirit.

It is doubtful if there is another article under the sun that exerts as much influence in the civilized world, is so freely handled, and as little understood as kerosene. First it is an arbitrary name applied to a *mixture* of petroleum products and differs from its kindred above and below more in degree than in kind, for petroleum can be compared to a book, which forms a complete whole, yet is susceptible of being divided into leaves and chapters. So with this substance; at every degree of the thermometer a product can be obtained with different characteristics. For instance, at low temperatures we find uncondensable gases; at the common heat of a summer's day we obtain an article called rhigoline, which boils at 65° F., and is far more volatile than ether; next, at a temperature not exceeding 170° F. there is distilled an article called gasoline; then as high as 280° F. comes over naptha; and up to 300° F. we obtain benzine, which, how ever, is only a trade name for a variety of naptha, for all that distills between 170° and 300° F. is denominated naptha, and subdivided into three grades.

All these various articles are similar in many respects. First, they contain no oil proper, then they are volatile at common temperatures, with great liability of their vapors catching fire from flames at a distance, and when mixed with the proper proportions of air (seven to *nine of air* with one of vapor) burn with an explosion, even when not *confined.* *As before* stated, at a temperature from 300° to 400° F., kerosene is distilled; after that come the paraffine oils, etc. This paraffine oil is not worth over ten cents a gallon, and naptha four cents—hardly any market for either; in one hundred barrels of crude petroleum, according to Prof. Chandler, there are one and-a-half barrels of gasoline, ten barrels of refined naptha, four barrels of benzine, seventeen and-a-half of lubricating oil, two of paraffine, ten of coke, gas and loss, and fifty-five of kerosene.

The Cleveland oil refiners claim to increase that yield of kerosene from twenty-seven to thirty-six per cent. No doubt of it, judging from the oil they ship to Colorado. But taking their estimates, there is from twenty-five to thirty per cent. of nearly useless products, which it is their interest to dispose of at as good a figure as possible, and a few gallons mixed with a barrel of kerosene, and a little paraffine oil to cover its presence, and the thing is done. There are works where six thousand barrels are refined each day. How much would be made on a barrel by the substitution of naptha, worth four cents a gallon, instead of kerosene, at, say twenty-four cents a gallon? Say five gallons; that gives one dollar per barrel, or six thousand dollars a day. The oil brought to Boulder shows twice as much of such adulterants, doubling the above figures, or $12,000 per day by trifling with our lives and property, though it of course sells a trifle cheaper than good oil. But some say, "I will run my own risks and save my money." So said the woman whose overturned lamp set fire to Chicago. She saved a few cents per gallon. How much did the city save? Can a community afford to allow that argument to prevail? Can our insurance companies? But the argument is pure sophistry. Good oil burns enough longer to more than make up for the difference in price.

But to the subject: if at every degree we obtain a different article, we say that kerosene when distilled with 100° range, must have different qualities or grades according as the temperature is varied, and it is so. An article brought over at the last half of the 100° differs materially from one brought over at the first half, and the article with the complete range of 100° must have compound qualities, which is the case, and we find its compound boiling point to be 350° F; specific gravity, 0.804. Hence, a perfectly pure kerosene is not all we want; paradoxical as it may seem, but as far as my experiments go in Colorado, we do not get that. What safety demands, is, that we should go farther, and have that grade of kerosene that will not give off explosive vapor or gases, at any temperature to which it is likely *to be subjected,* when in domestic use; for instance, any thing that will take fire at a given temperature, and yet cannot be used unless subjected to that temperature, is unsafe to be used in a family among children, or be left where an accident can possibly happen, from causes beyond our control, and this is exactly the case when we bring low grade kerosene into our homes; but if it can be proven that this variable article can be obtained, of a safe grade, giving all qualities of a good light, in view of the many and serious accidents to life and property, we ought to insist upon our markets being supplied with it.

Let us see what are the temperatures that lamps will attain in burning the ordinary kerosene. This depends very much upon the chimney and burner. A good burner has as small amount of metal running from the burning wick to the collar of the lamp—as that part is called that receives the burner—as is compatable with strength, because the greater the body of metal the better the conductor of heat it is, and the more heat there will be at the base of the burner, as that part is called that goes into the collar and fills the mouth of the lamp. This heat is in direct contact with the dangerous vapor that all low grade kerosene gives off, the more rapidly as the temperature is raised.

Suffice to say without going into too much minutiæ, that a lamp that gets so heated, that it is uncomfortable to hold it at the collar, is dangerous with our low grade oils. As to chimney, it should be well fitted, because a lamp burned without one, rapidly runs up in temperature, and they have been known to get as high as 161° F. at the collar, in fourteen minutes. So we say that the heat of a lamp depends upon whether it has a chimney or not, kind of burner, grade of oil, size of wick and flame, length of time burned, temperature of the surrounding air, and kind of material of which the lamp is made. In an explosion, metal is the safest, because there are but few flying fragments, and the farther the oil reservoir is from the burning wick, the safer the lamp is, provided the oil is securely fastened in when the lamp is accidentally tipped over. There should be a free current of air in and around the flame, to carry off the heat generated, and supply oxygen for combustion.

Most of the lamps in use are made of glass, with a brass collar fastened at the mouth of the oil reservoir, into which the burner is fitted, so that the heat of the burning wick is promptly conducted to the collar, and from thence radiated to the oil, the greater the surface of which is exposed the more rapidly the inflammable vapor is given off, and rest assured the space not occupied by oil, always is by vapor. In a room at a temperature heat (65° F.), with the safest burner I have *been able to obtain,* (new calcium light, but the poorest to hold a chimney), I have found the collar after the lamp burning several hours, to be at 105° F., the space between the collar and oil at 90° F., oil at surface 80° F. and the bottom of the reservoir varying a little from 70° F. This with a well fitted chimney. But let any accident happen to the lamp by which it becomes broken—and how often we see glass break apparently without cause—and all these temperatures would become augmented to a degree that I have not dared to test, with the grade of oils found in our market. But experiments have been conducted where the heat at the collar rose to 161° F., a very dangerous degree to subject our present grade of oils to. But we need not estimate at this extreme heat; just take the 105° F. as I found it at the collar, and let that lamp be accidentally broken, the fragments of the lamp drop in the midst of the spilled oil, the far hotter chimney and wick tube generates more vapor, and unless the fall fortunately extinguishes the light, the burning wick sets fire to the spilled oil, to say nothing about the danger of an explosion.

In over-heated rooms near the ceilings, in engine rooms, and some factories or bakeries, how often does the heat get that high? And when it does, the oil in use in Colorado becomes a constant source of danger, the inflammable vapors are rapidly given off, forced up with the oil to the burning wick or through the so called safety tube at the side of the wick tube; if there burned as fast as generated, all is well, but if generated faster than burned, in a confined room with no draught to carry it off, or dilute it below the danger point; on the contrary, it is left to become mixed with the right proportions of air, an explosion must ensue; or let that lamp to be moved suddenly from its warm surroundings to a cooler atmosphere, there occurs a condensation of the vapor filling the space not occupied by oil, air is sucked in to fill the vacuum, it mixes with the vapor, the flame is at hand to fire it, and explosion is the result; (this last is no supposition, it actually occurred in our State University, a lady holding the lamp at the time.) All this can be avoided by a law prohibiting low grade kerosene from being sold. But says one, "I have no sympathy with those who cannot carry a lamp without dropping it! Such accidents are not the fault of the oil." Certainly not; but how much safer we would be, if the lamp contained a grade of oil that would not give off dangerous vapors at common temperatures. And lamps burst without any person being near them, just as chimneys break, because if glass is not properly annealed, or is of unequal thickness, it has different expansive powers. Then high and sometimes common temperatures break them. The flaws and specks in glass have been claimed to be caused by an imperfect melting of the ingredients out of which the glass was made. If so, they must have different expansive powers, which in a rapid change of temperature causes the speck bedded in the mass to act like a wedge or diamond, splitting the glass apart. Let such occur in a hall lamp in the middle of the night, or in a room lamp when the inmates are out, the mysterious fire is explained; or a chimney break while one is away to church, the lamp gets rapidly heated, and then nothing but a high grade oil prevents a tramp or an incendiary being credited with that fire. The insurance companies pay the loss. Would it not be much cheaper for them to combine and prevent that fire? The insurance companies of the United States could procure the passage of a law, raising the test of the United States to a proper grade, and protect themselves.

On November 29, 1877, I procured samples of oil from every store in Boulder that dealt in kerosene, eight in all; and on testing them, found four to flash at 64° F., two at 68° F., one at 74° F., and one at 90° F. On December 8, 1877, I repeated the tests with fresh samples from fresh barrels, this time they ranged from 64 to 75° F. Any of the lamps after burning an hour or so would give off a vapor, that upon removing the burner and applying a lighted match to the mouth of the oil reservoir, would flash like gunpowder. Several times on different days, I repeated the experiment in rooms without a fire in them, and the lamp cold, not been lit since the previous evening, and yet a flash occurred. These results prompted me to experiment, and I put fifteen fluid ounces of this kerosene, with a flash point of 64° F., in a common retort with a thermometer inserted, and applied an alcohol lamp, raising the heat to 170° F., obtaining one fluid ounce of gasoline, or six per cent. of distillate, then continuing the heat to 200° F. I obtained two fluid ounces of the lower grade of naptha, or in all, three fluid ounces of the lowest kind of adulterants, or twenty per cent. of falsification, after which upon testing, its flash point was found to be 110° F. Similar results were obtained upon a repetition of the experiment made before the Town Board of Health of Boulder.

A merchant of our town requested me to test a sample of a new oil that he had sent for, which was branded, "Prime White Headlight oil, 150° fire test; Standard Oil Company, Cleveland, Ohio." Up to this date, all the oil sold in town was of one brand, and this new oil was worth, in consideration of its superior qualities, forty-five cents per gallon, the other kind thirty-five. I tested it and found it to flash at 95° F., just 55° under its brand. I then cooled it to 28° F., and it promptly turned thick and white. Thus it proved that the merchant and all his customers were being swindled by paraffine oil being added in large quantities, and it then did not bring the flash point to a respectable figure.

I tried another experiment. I placed thirty-two ounces of our oil that flashed at 66° F., in a platter with a superficial area of one hundred square inches. This was exposed to evaporation in a room with a temperature from 40 to 45° F., for five days, in hopes that by evaporating off the naptha, a higher grade oil could be obtained by any person unable to purchase it at a store. At the expiration of the fifth day, I measured it and found it had lost over twenty-one per cent., and had gained a flash point of 136° F., being 70° increase. That evening I tested my newly manufactured high grade (that is for this town,) and was surprised to find that it gave no better light than a specimen burning by the side of it, taken out of the same sample before evaporation, which as before stated, flashed at 66° F. Here was an unexpected result; the two oils had the same light power—that is, as near as my home-made photometer would indicate—and as it originally flashed so low, I never thought of such stuff being worthy of further adulteration, but next day the idea occurred to test for paraffine; there it was sure enough, and plenty of it. What could have been the composition of such a fraud? It must have been mostly naptha covered up with paraffine, and had time permitted, I would have distilled it and seen what per cent. of naptha it did contain.

Are the rest of the towns in Colorado so blessed? Comments are useless on the criminality of selling such a mixture and calling it kerosene. With exception of the recent brand of "Prime White Headlight Oil," all the oil sold in Boulder for the past year, has been branded "Carbon Oil, Standard Oil Company, Cleveland, Ohio, and New York, warranted 110°, fire test, E. Fowler, inspector." The same brand and humbug inspector, figure as dishonorably in the illuminating oil reports of other Boards.

As regards the fire test that the barrels have branded on them, a flash or blue flame upon the application of a burning match or taper to the surface, is really a fire test, yet the same oil will often require to be heated ten or more degrees F., before it will take fire and burn, upon the same match being *quickly* plunged into it; yet slowly insert it, and it will take fire. In fact a test of kerosene to be reliable, must be made by a reliable inspector, with a proper apparatus, one that as nearly as possible, places the oil in the same conditions it is subjected to *when burning in* a lamp; as it is usually inspected by the hired man of the refiners (for in fact that is all he is, as there are no official oil inspectors appointed, under bonds and other proper safeguards, by the state authorities, where oil refiner's influence can be exerted), it is of but little value, and an honest inspection will often show it to be from 10° to 25° below the brand, and where willfully adulterated, as for instance, the oil sold in Boulder, to be from 44° to 55° below the brand.

On an ordinary summer day nine-tenths of the oil sold in our state, so far as I have been able to test, will give off such quantities of inflammable vapors that a lighted match applied to the mouth of an open lamp will cause an explosion strong enough to extinguish the match.

Wishing to further test the question of what process would purify the oils for sale in our market, I took one quart of it, flash 68° F., Beaume 47°, and putting it into a glass retort applied heat to 75° F. for two hours—faint dew in vault of retort; then heating for five hours at from 100° to 200° F., which brought over half an ounce of distillate (Naptha); then heating for three hours to 260° F., five drachms of distillate were obtained, the oil in retort turning to dark amber; after that the oil was heated to 300° F. on different days, as time could be obtained, until one-third of the quart was brought over, it having all the properties of naptha; the process was then continued until another third of the original quart was obtained. This second portion was tested, and it flashed at 132°, and was of a very pale straw color, with some empyreumatic odor. Subjecting one ounce of it to a cold bath of 20° F. it retained its transparency. The remaining third in the retort, of a very dark color, with disagreeable empyreumatic odor, was tested and it flashed at 290° F.; congealed at the freezing point, showing heavy and paraffine oils.

This experiment would seem to prove that a fairly safe oil can be distilled at 300° F., flashing at 132°, but it also proved that no firm would be willing to make good oil at that temperature, as it took me time equivalent to one week's steady night and day distillation to separate the above mentioned two-thirds of a quart from the one quart, in the simple apparatus I used, though no doubt if it had been in a broad bottomed still it could have been done in a far shorter time.

A great deal might be said about the dangerous qualities of gasoline, naptha and benzine, as fluid for burning in our lamps; how their use is as though we were to burn gunpowder to heat our rooms, and how deceptive their cheapness is, how good kerosene lasts more than enough longer to pay for the difference in price, not to mention the increase in safety to lives and property, and how no person has any right to jeopardise the property around him for the sake of a gain, real or imaginary. But it is all unnecessary; it must be evident from what has been said that the sale of such dangerous mixtures under any name whatever, is wrong. To this wrong there must be a remedy. The experience of other states has proved that it consists in taking the matter into our own hands, and out of the oil refiner's, having our own standard, doing our own testing, by our own inspectors, with our own apparatus. In short, create a demand for a good and absolutely safe grade of kerosene, and no fear but what the supply will equal the demand, as has been the case with other communities.

In adopting an apparatus for testing our illuminating oils, it is best to not depart very far from the standard apparatus now in use and found to work well. Consequently the one now to be recommended is essentially that devised by the Michigan State Board of Health, and legally enforced in that state, described at length as follows. and which I earnestly recommend to be incorporated in a law.

The apparatus for testing illuminating oils shall consist of

A spirit lamp;
Thermometer;
Thermometer rod;
Testing rod;
Lamp stand;
Water bath;
Oil cup;
Oil cup cover;

Each article to substantially fulfill the following description:

The spirit lamp to not exceed three inches in diameter and two inches in height.

The thermometer to be reasonably accurate, and be one of the varieties used by scientific societies, but its scale shall be converted into the Fahrenheit scale.

The thermometer rod to be made of iron or steel wire, caliber No. 12, with a hook or other device on its upper end to hold the thermometer.

The testing rod to be eight inches long, made of iron or steel wire, caliber No. 22, with a pellet of cotton wadding or batting, one-fifth of a troy grain in weight, firmly twisted on to its fire end.

The lamp stand to be made of sheet copper, as follows: To be eight inches in hight, and three and-a-half inches in diameter, with an aperture in the side large enough to readily introduce the lamp, and with *sufficient air holes* to admit of the lamp burning freely.

The water bath to be made of sheet copper, three and three-eighths of an inch high, and three inches in diameter, with a flange around it one-half an inch in width, joined at right angles around the outer and upper edge, to support it in the lamp stand.

The oil cup consisting of two sections, the lower section being the oil receptacle, and the upper section—the vapor chamber, both to be made of sheet copper. The oil receptacle to be three inches high, and two and three-fourths of an inch in diameter, with a socket on the inside to firmly hold the thermometer rod. The vapor chamber to be formed by a flange and rim around the oil receptacle as follows: The flange to be one-fourth of an inch wide, joined at right angles to the upper and outer edge of the oil receptacle, and the rim one inch wide, joined to the outer and upper edge of the flange, at right angles, projecting upwards.

The oil cup cover to be made of sheet copper, to fit the vapor chamber, with an opening in it, to admit of the thermometer rod passing through, and a second opening to admit of the thermometer passing through, and a third, oval in shape, two inches long by one and a quarter inch wide, for the purpose of admitting the testing rod when used.

The method of using the illuminating oil tester to be as follows: The water bath containing sufficient water to envelope the oil cup at least two inches from the bottom, to be placed in the lamp stand, the oil receptacle to be filled with the oil to be tested, level with the flange. the cover with thermometer rod in place, to be closed, and the whole to be placed in the water bath, and the thermometer to then be so adjusted that its bulb shall be fairly immersed, and not in contact with the side of the cup, and its scale to the front. The spirit lamp burning alcohol, then to be placed in the lamp stand, with wick so trimmed as to raise the heat of the oil not more than five degrees each minute, and as soon as the thermometer indicates that the oil is heated to one hundred and forty degrees, Fahrenheit, the inspecting officer shall bring the burning end of the testing rod—the pellet of cotton on it having been saturated with the oil being tested—close to the surface of the oil in the receptacle, and if there shall occur a slight explosive flash or a blue flame, or the vapor or gas given off by the oil in the receptacle burn, then the oil shall be declared to have "not stood the test" required by law, and the package containing it to be branded by the officer "rejected for illuminating purposes;" but should there be no explosive flash or blue flame, nor a burning of gas or vapor, then the oil shall be declared to have "stood the test" required by this law, and forthwith the vessel, cask, barrel or package containing it shall be branded "Standard Illuminating Oil of the State of Colorado, flash test 140° F," or such other figures as it may actually be over 140° F.

A law to be effective should embrace the following points:

First—Provide an apparatus.

Second—Provide for its method of use.

Third—Provide for a responsible officer to use it, and for his appointing deputies.

Fourth—Prohibit these officers from engaging in the manufacture or sale of illuminating oils.

Fifth—Provide for their compensation.

Sixth—Define the wording and style of the brands, both for rejected and approved oils.

Seventh—Provide for the punishment of parties using a branded package the second time, for counterfeiting, altering, or erasing, an illuminating oil brand; also for canceling the same by the proper person when the package becomes empty.

Eighth—To prohibit the storage of oils without inspection.

Ninth—To empower the inspectors to examine any oil supposed to be falsely or not properly branded, or to be below the legal standard, or adulterated, and to forbid the sale of such oils until properly examined.

Tenth—To provide against the admixture of paraffine oils or any other articles in quantities that will not admit of the oil remaining clear, and transparent when cooled for ten minutes, to the temperature of twenty degrees above zero, Fahrenheit scale, or will emit a combustible vapor when heated to one hundred and forty degrees, Fahrenheit scale. The quantity used in these tests to not be less than a half a pint, wine measure.

Eleventh—To punish the selling, giving away or lending of kerosene or other illuminating oil below the standard, or other violations of the law.

Twelfth—To provide for the recovery of damages by any person who may be injured in person or estate, by the sale, use, giving away or lending for illuminating purposes, of kerosene or other oil not conforming to the law.

Thirteenth—To allow no other brands but those of our own state to be offered in evidence in extenuation of cases arising under this law.

Fourteenth—To provide for the registration in books, open to public inspection, kept by the inspector or his deputies, of all illuminating oils tested under the act; the register to state manufacturer's name, owner's name, name of person offering it for sale, date and result of the test, and the original flash or fire test that was found branded on the package, name of the oil, and name of Colorado officer making the inspection.

REPORT

ON

SEWERS, SEWAGE AND WATER SUPPLY,

INCLUDING

LETTERS FROM PHYSICIANS UPON THE SANITARY CONDITIONS AND DISEASES OF VARIOUS TOWNS AND CITIES IN COLORADO.

BY F. J. BANCROFT, M. D.

In the absence of that statistical knowledge concerning the sanitary condition and needs of the principal towns and cities of Colorado, which was necessary for the satisfactory completion of my last year's report upon "Sewers, Sewage and Water Supply," I addressed to one of the leading physicians in each of the large towns, the following questions:

First—What have Boards of Health, or the local authorities done to place and keep your town in a good sanitary condition? What kinds of privies are used, and what is done with the human and animal excremental matter, slop water and dry refuse?

Second—From what source is your drinking water derived? If from streams, are they, above your point of supply, receptacles of filth, the washings of placer mines, or tailings from ore mills? If from wells, is their supply of water affected by irrigation? Do they usually dip into, or go through beds of clay, or slate, which are impervious to surface water? Is there any rule enforced as to the distance at which they should be located from privies, cesspools and slop holes?

Third—Have endemic diseases, such as cholera infantum, diarrhœa, typhoid fever, etc., prevailed to any considerable extent in your vicinity, and have they been of a severe type? Have contagious diseases been intensified, or made epidemic by water or air pollution?

In response to these questions, the following papers have been received:

FROM ALMA.

ALTITUDE: 11,044 FEET ABOVE SEA LEVEL.

F. J. BANCROFT, M. D., *President State Board of Health*:

In response to your inquiries of recent date, I would reply:

First—We have no Board of Health, nor organization of similar nature, and our local authorities give no attention to the sanitary wants of the people beyond the annual spring cleaning of streets and gutters. Privies are not regulated by town ordinance, and are usually vaults, curbed with pine lumber, and located according to the taste and convenience of property owners. Slops are thrown into gutters or back yards and, with garbage, animal excrementæ, etc., permitted to soak into the soil, or slowly gravitate toward the drainage channels.

Second—Water from wells forms the principal supply for drinking and culinary purposes. A mountain brook coursing through the town furnishes excellent water, except during such times as a stamp mill and arastras located above the town are in operation, which is perhaps one-half of the time in summer, and less in winter. At least one-tenth of the population use the water from the spring. Nearly, or all the wells are sunk in a gravel drift consisting of detritus from the surrounding mountains, and the water, consisting in good part of "surface water," holds in solution all the soluble substances of which the drift is composed, among which are lime, magnesia, alumina, iron, copper and lead, with an appreciable amount of organic matter. In the summer months, while the soil is kept saturated by the melting snows, or the daily showers of the "rainy season," the water of the wells is kept dilute, and the mineral constituents bear a lessened ratio; but in winter when the soil transmits a less quantity, the wells become "low," and the proportion of mineral substances in the water is increased. The number of wells in the town is few, one usually serving for a whole neighborhood. Of these public ones none are nearer, I should say, than fifty feet to any privy. A few private wells are within twenty, perhaps fifteen, feet of privies, there being no rule or law bearing on the matter. The town is favorably situated as to drainage, being built on the side of a hill, the slopes of which lead to Buckskin creek and the Platte river, and an irrigating ditch aids, during the summer months, in carrying the filth of the streets to those streams. During the winter while no water can run in the ditches, and the frozen ground is covered with snow, the streets and yards become very filthy.

Third—My acquaintance with the place is of two years' standing, during which time, in spite of its apparently insanitary condition, neither cholera infantum, diarrhœa, typhoid fever nor dysentery has prevailed to any extent. Indeed, during that time I know of no case of typhoid fever having occurred in, nor immediately near the town. I learn that during the summer preceding my arrival, viz: the summer of 1875, a few cases of typhoid fever, none of which were fatal, occurred in one family. No inquiry was instituted as to the cause. Neither contagious nor infectious diseases have come under my notice during the above time.

During February, March and April of the year 1876, pneumonia prevailed to an extent to warrant its being classed as an epidemic. It was characterized by great malignity, the *ratio of deaths to cases* being as six to ten. The first cases occurred at a time when warm, *pleasant days succeeded* a protracted cold spell. Each time the weather turned cold, the occurrence of new cases ceased, to be resumed when the weather again became warm. This epidemic, influenced as it seemed to be by the weather, intensified by warm days, checked by cold, held in suspense by snow-storms, and exerting its greatest virulence in the vicinity of the junction of our two drainage channels, toward which focus the accumulated filth of the winter was being slowly carried by the melting snow, warrants the placing of germs from decomposing animal matter as among the possible causes which originate pneumonia, and increase its mortality.

Although the altitude of Alma is very great, nearly 11,000 feet above the sea level, I have not observed that peculiarity as exerting any influence on the diseases that have come before me, with the exception of pneumonia. Pneumonia is undoubtedly largely influenced by altitude, and the consequent rarefaction of the air.

The diseases encountered by me during my two years' residence at this place have been simple in their nature and, except in the cases of pneumonia, easily relieved. Neither scarlet fever, croupous, laryngitis, diphtheretic laryngitis or rubeola, have visited the children, and the adult population has been equally fortunate in its exemption from the more severe diseases of mature life. Fevers are usually of the remittent type and yield to full doses of quinia with almost as great promptness as in the east where their malarial character is taken for granted. Wounds, surgical or otherwise, are nearly always followed by erysipelatous inflammation which usually does no mischief. Puerperal women fare fully as well as their sisters elsewhere, not a single unfortunate case of full-term labor having happened, to my knowledge.

I have no means of estimating the influence of this particular locality on cases of phthisis pulmonalis, as the long winters deter invalids from selecting this as a permanent home, and the observation of cases for a few days or weeks during the summer, does not afford sufficient basis on which to found an opinion.

In looking about for reasons with which to account for what seems the unusual exemption from disease, of this South Park region, two suggest themselves as undoubted, and a third as possible. The prevalence of a westerly wind during much of the time, blowing from mountain tops clad in perpetual snow, and incapable of yielding noxious vapors to the air, and the rapid decline in elevation to the eastward by which our streams obtain a swift current and fast remove the sewage received by them; these might seem probable factors, and a possible one be found in the presence of a highly ozonized atmosphere, ozone not infrequently marking from six to nine on the scale as recorded by Professor C. S. Richardson, of this place.

Very respectfully,

D. H. DOUGAN, M. D.

PARK COUNTY, COLO., November 12, 1877.

FROM LONGMONT.

ALTITUDE: 5,600 FEET ABOVE SEA LEVEL.

Dr. F. J. BANCROFT, *President State Board of Health:*

DEAR SIR: My attempt to comply with your request for information concerning the sanitary condition of the town of Longmont, and the diseases which have occurred during the two years just past, will be merely a matter of opinion and theory, as I regret having kept no statistical report, or memorandum as regards numbers, physical examination, duration, etc. No endemic, epidemic, or contagious diseases have visited us excepting scarlet fever. This gave us a thorough scourging during the winters of 1875 and 1876-'77, occurring in *all of its various types,* there being about one malignant case in every eight, and, notwithstanding many cases were nearly despaired of, only five or six were lost in two hundred and forty or two hundred and fifty cases, occurring within an area of six miles of Longmont. I am under the impression that the advantageous sanitary position, the sparsely inhabited and new condition of the town assisted liberally in reducing the mortality in this usually fatal disease. One feature I do not remember witnessing in any other locality was a decided abatement during pleasant weather, while each storm brought a succession of new cases.

We have no Board of Health; the town officers keep the streets and alleys comparatively clean. The privies are vaults in the ground, not inclosed with walls, and I believe, with few exceptions, have not been cleansed since the town was founded. The animal excremental matter is taken to the farms surrounding the town, where it is in demand. The stables and alleys are kept well cleansed. Slop water and dry refuse is thrown into the middle of the streets as near as may be—the streets being frequently scraped and cleansed—and the scrapings drawn out of town.

Water runs on either side of the streets, supplying moisture for the growth of trees. Our supply of water is from a mill-race, tapping the Storain creek, one mile above, and passing through the town. The water is clear and free from impurities. There is but little if any placer mining or milling ore on this stream. Quite a number of dwellings are supplied with cemented cisterns, filled by the rainfall on the roofs, which is adequate for all demands even in this dry climate, and which, I believe, here as elsewhere, is the most healthy and palatable water used. Cholera infantum, typhoid fever, and diarrhœa have not prevailed to any considerable extent, the type being mild and the attack almost universally of short duration.

Contagious diseases have nor been intensified, nor made epidemic by water or air pollutions. The scarlet fever contagion, I think, was usually conveyed by actual contact; visiting and assisting in nursing the sick. During the spring months of 1876 the disease had entirely left this locality. For four months I knew of no case. During the latter part of August some parties traveling from Indiana to Washington Territory stopped in a vacant house near the edge of the town site. Their children were sick, and on visiting them I found their disease to be scarlet fever of malignant type. They buried two children, six having been attacked. They had been eating salt bacon and soda biscuit for some months, and treatment, successful heretofore, made but little impression on these non-acclimated and improperly fed children. The cast off garments and clothes containing the expectorations and exfoliations of the diseased, were left on the floor of the vacant house. Late in the fall of 1876, when a lake near this vacant house had frozen, the pupils from the public school went to the lake skating; while perspiring, many of them went into the vacant house, sat down on this contagious, cast-off clothing to fasten and unfasten their skates. A few days after, the scarlet fever started in several different parts of the town. I think the contagion was also not infrequently conveyed by parents and nurses going into the crowded post-office at mail hours. Hoping I will be able to give you statistics for your next report,

I remain yours, respectfully,

J. V. JONES.

LONGMONT, November 23, 1878.

FROM GOLDEN.

ALTITUDE: 5,500 FEET ABOVE SEA LEVEL.

DR. F. J. BANCROFT, *President State Board of Health* :

DEAR SIR—*I will briefly* sketch the answers to your questions. If you find them worthy *of putting in form for* reporting, you are at liberty to do so, or reject, if unworthy.

There is no Board of Health in existence. Our "authorities" think it unworthy of them to look after so small a thing as the sanitary condition of their town.

Dead animals are taken to the mere outskirts of the town limits, and there left to decompose, or be eaten by dogs.

There is no law enforced in regard to privies, or sinks. The privies are mere holes in the ground—at the option of the parties—and, when they become full, the house is removed and the stinking mass covered with a few inches of earth. The slops, from out-houses and kitchens, are allowed to run to the street, or alley, as the incline from the house may be. Clearings from stables are thrown into vacant lots, or back alleys.

In many parts of town the accumulation of bones from butcher shops and kitchens are collected by dogs to many hundred pounds, and, I can say, to pass one of these places during hot weather, is sickening.

Our drinking water is derived from wells. Their depth depends upon the dip of the clay bed upon which it is found. All wells under ditches are more or less affected. In portions of town, some of the wells are not to exceed ten feet deep, and in very wet weather the water rises to within a few feet of the top. In many places these wells and privies are not to exceed thirty feet apart.

During the hot months of last summer, we had but little disease as compared with the four preceding years. But all cases of whatever disease of the bowels, terminated in a low form of typhoid type, fever running the same course as true typhoid. In September, true and severe typhoid fever was quite prevalent, being confined to low ground, and close to slow and sluggish streams, covered with a stinking green scum. The cold freeze of November cutting short the typhoid fever, evidently proves that animal, or vegetable matter was its cause, and, its being confined to the low and filthy portions of town, more conclusively fixes the producing cause in my mind.

S. T. FLOYD.

GOLDEN, COLORADO, January 2, 1878.

FROM CAÑON CITY.

ALTITUDE: 5,260 FEET ABOVE SEA LEVEL.

DR. F. J. BANCROFT, *President State Board of Health* :

In reply to your interrogatories respecting sanitary condition of our town, I report :

First—Local authorities have provided as far as possible for the removal of all surface filth from the streets, and ditches or gutters. Ordinary vaults are used for privies, which is a matter of little consequence so far as its effect upon water is concerned, as there are but two or three wells in town, and they are situated close by the river bank, and the water from the stream sweeps through the boulders and gravel into the well. In this case it may be well to state that the surface soil of our town is clay or adobe, which averages from four to six feet deep ; underneath this is a mixture of gravel and boulders extending down to bed-rock, and has so thoroughly intermixed with it alkali and mineral salts that the water of wells is entirely unfit for use, unless as before stated, they are situated close to the river's bank.

Second—Drinking water is taken from the river, usually conveyed by ditches, above which there are no washings of filth, mines or mills, for a distance of fifty or seventy-five miles up the river. During the greater portion of the year, the water is clear and apparently *pure, though of* course not entirely so.

Third—No epidemic or contagious diseases have prevailed here during my residence, (six years) except scarlet fever three years ago in a very mild form, and four cases of typhoid fever in one house two years ago, which was attributed to decay of vegetables and bad drainage in the cellar of the house.

In conclusion I can say positively that this is a very healthful location, and more free from acute disease of any kind than any location I have ever known. Sickness here is confined almost exclusively to those who come here in search of health.

Very respectfully,

J. S. PRENTISS.

FROM GREELEY.

ALTITUDE: 4,770 FEET ABOVE SEA LEVEL.

DR. F. J. BANCROFT, *President State Board of Health:*

DEAR SIR:—Having been absent from home for the last two or three months, I failed to receive your letter until the present, which I hope will be a sufficient apology for the delay, which I much regret.

First—We have a local Board of Health, whose duty it is to look after and cause to be removed all filth and offensive matter found in the streets, alleys, etc., as far as practicable in a town so recently established as ours. Our privies are wooden buildings without vaults, calculated for the removal of the excrement as it accumulates, to be mixed with dry earth and used as fertilizers by our gardeners. To effect this removal at all times, is found very difficult and a source of much annoyance.

Second—Our supply of water for drinking and for all household purposes, is derived from driven wells, passing through a strata of clay or sandy loam, about five or ten feet thick, when a gravel bed is reached. Water is usually found at a depth of from eighteen to twenty feet, the supply of water at this depth being unlimited, and not affected by irrigation. There is no slate or hard-pan in our vicinity.

Third—In the early settlement of our town, before our lateral ditches were completed so as to carry off the surplus water, much stagnant water was allowed to accumulate in lower grounds, promoting a rapid growth of weeds, which in time began to decay, producing malaria, followed by general prevalence of fever, first of mild character, later in the season of a more malignant type, resulting in a death rate of about five per cent. As soon as our ditches were completed, so as to carry off the surplus water, the disease disappeared. Since then we have had but few cases of fever, and they of mild type and short duration. But few cases of cholera infantum or diarrhœa occur in our vicinity. A single case of small-pox occurred in our town last season, which resulted fatally, perhaps owing to exposure and neglect in the early stages of the disease; (the patient was a tramp). No further spread of the disease occurred.

As regards the influence of irrigation upon the health of the community, I regard it as salutary, provided sufficient care is taken to prevent the growth of weeds in the water courses, which, through the influences of heat and moisture, will decompose, and must result in much evil. I regard this as a sanitary measure, which cannot be too strongly urged, upon all living within the bounds of any irrigating canals. A few cases of fever have come under my notice in the country, evidently from neglect in this respect.

*I regret that circum*stances compel me to answer your request so briefly.

GREELEY, November 10, 1877. J. S. SCOTT.

FROM COLORADO SPRINGS.

ALTITUDE: 6,023 FEET ABOVE SEA LEVEL.

DR. F. J. BANCROFT, *President State Board of Health:*

DEAR SIR—The report is for the year ending November 1, 1877. The means of information have been personal observation, circulars addressed to all resident physicians, and an inspection of the undertaker's record. I am confident the facts given are more accurate than is generally the case where reliance is placed simply upon official statistics, the smallness of the city making great care possible.

The population is estimated at 3,000; this estimate being based upon a careful census taken early in the year. This population occupies three hundred and eighty dwellings, including four hotels, and is spread over a space of four square miles. Excluding the business blocks, which do not, as in most small cities, have apartments over the shops, the most densely filled block (four hundred feet square) has but twelve dwellings upon it, giving for some time to come, assurance of freedom from dangers common to denser population.

There are reported to have occurred during the year;

Pneumonia	18 cases.
Dysentery	14 cases.
Scarlatina	11 cases.
Typhoid Fever	8 cases.
Diphtheria	3 cases.
Measles	3 cases.

The deaths for the same period have been;

Scarlatina	3 cases.
Tubercular Meningitis	2 cases.
Diseases of Heart	2 cases.
Puerperal Fever	1 case.
Cancer	1 case.
Cholera Infantum	1 case.
Inanition	2 cases.
Old Age	2 cases.
Accident	2 cases.

No account has been taken of cases of, or deaths from, phthisis pulmonalis. This is just, because, as all the cases of that disease are imported, and all deaths are among transient residents, the result has no bearing upon the health of the city, save as the presence of so many invalids might exert a depressing effect upon the general powers of resistance to accidental diseases. But, although I do not err when I state that the large majority of our population is made up of invalids, restored consumptives, and the families of those who have come here for their health, I am able to say that I see no evidence of such depression. Therefore, in making up the rate of mortality, deaths from consumption of the lungs are excluded, and five hundred is deducted from the population as the probable number of consumptives here. A very liberal estimate. We have, then, excluding two deaths from accident, total deaths fourteen—a rate of 5.6 per 1,000—of which from zymotic disease, four—a rate of 1.6 per 1,000.

The above statistics call for some remarks. Of pneumonia, eighteen cases are reported *with no deaths.*

It is necessary that the statements of physicians should be given by the reporter as received, but it is also right that they should be by him corrected from facts known, or from internal evidence of incorrectness. Surely such evidence is present when eighteen cases of so fatal a disease as pneumonia is at this altitude, are reported with no deaths. We must think that a mistaken diagnosis has led to a grave name being given to a light disease, and consequently that pneumonia has not been so prevalent as would appear.

The same remarks will apply to typhoid fever, of which eight cases are reported, again with no deaths. When it appears that, of the eighteen cases of pneumonia, nine were reported by one physician, who claims also six of the eight cases of typhoid fever, we must doubt the accuracy of the report. Of scarlatina, eleven cases are given. Three deaths. During the month of May, five light cases occurred in one family, directly traceable to contagion from one case, also light, in the family of a washerwoman. Two cases occurred among guests at a poor hotel. The first—sickness immediately after arrival from Kansas; and the second, a few days after arrival, from having been put into the bed just vacated by the first. Two cases are reported in July; one in September; one not given.

It will be thus seen that all cases have occurred during the warm months.

The cases of *measles* have been very light. *Dysentery* gives fourteen cases, with no deaths. Summer complaints of children, and diarrhœa of adults, were frequent and intractable during the summer months. A few remarks upon these truths, will be in place under the head of water supply.

WATER SUPPLY.

The most important question bearing upon the future sanitary condition of the city, is that of the water supply. Future, because the soil has not yet had time to become filth-soaked, and the water, consequently is not yet polluted; still all the circumstances exist, which must in time inevitably lead to serious trouble. The supply is from wells which are filled entirely by surface drainage.

The occupied portion of the town plot covers four square miles, the surface being about forty feet above adjacent water courses. The soil consists of from six to twelve inches of light loam, and from forty to sixty feet of peculiarly loose gravel, resting upon a bed of compact blue clay. The surface dips to the south-west, with a grade of forty-five feet to a mile, the clay, as far as known, sloping at the same rate. When the town site was selected, a trial well was sunk at the northern part, to clay, without finding water. A second at the center of the town, with similar results. A third at the southern part, produced a small quantity of bad water. Meanwhile, ditches were being dug to convey water from the adjacent streams, for irrigating purposes, and within a month after the water was allowed to flow in them, these wells showed from six to sixteen feet of water. This, taken with the fact that, every spring when the ditches are filled, the water notably rises, makes it quite certain, that our well water is obtained entirely from the surface. There is no legislation regulating the distance between privies, swill-pits and the wells.

We have present, then, all the elements for the rapid and perfect propagation of disease; surface water, a porous soil, and contiguous filth holes. But as yet, so far as I have been able to gather, with perhaps a single exception, no disease can be traced to, nor appear to have been aggravated by this condition of affairs; nor does there appear to have been any general state of depressed health, or peculiar susceptibility to contract disease. The only apparent contradiction to this, appears to be the undoubted prevalence of bowel troubles, among adults and children, during the summer. And to this question, throughout the summer, I gave the closest attention, being able to test the matter crucially, from the fact that two kinds of water are used, the most using the water in question, but many having all their drinking water brought them from a fine spring below the city, which gives a water of undoubted purity and excellence.

Now after careful inquiry in many cases by the reporter and others, it is certain that bowel complaints were fully as prevalent among those using the pure spring water, as among those drinking from wells.

I am rather disposed to attribute the chylo-poëtic disturbance to the use of the imperfectly ripened and frequently unsound fruits which are brought here from California, which, as yet, is our principal source of supply for these luxuries.

BOARD OF HEALTH.

The Health Board consists of mayor, city physician and constable. Their powers are confined to the abatement of nuisances and prevention of contagious diseases. For the latter purpose they are given the usual cruel and despotic authority; powers which should never be given to boards constituted as they generally are, the effect being, as in cases of all excessively stringent legislation, that the laws become null from the disobedience of those for whom they are made. During the year the sole act (a wise one) of the local Board has been to urge vaccination upon the school children. No nuisances have been abated, but it must be allowed few exist in so sparsely filled a city, save in the matter of privies. Neither these, nor the disposal of kitchen offal, are regulated by any legislation as yet. By an order of the late board of trustees, an order now void, the earth closet system was made compulsory, and is still in general use. The system is probably the best there can be devised for a small community, if properly conducted under a thoroughly efficient system of inspection, but nothing of this sort is done, and we are only saved from disaster by the circumstances before referred to, which protection must surely lapse with time.

JACOB REED, M. D.

COLORADO SPRINGS, November 3, 1877.

BOULDER, COLORADO.

ALTITUDE: 5,536 FEET; POPULATION, 3,500.

DR. F. J. BANCROFT, *President State Board of Health:*

DEAR SIR—In response to your question as to the sanitary condition and water supply of this town, I will state that our Board of Health had the town well scavenged in November last; the work was thorough, and our town is in all probability the cleanest in the state; but like all other places, we have sources of disease which need continual watching. You ask what kind of privies are used? Generally a hole dug in the ground and not walled up. This is used till it needs to be filled, and is usually filled with earth from a new one near by; sometimes the digging of the new one is neglected, and every passer by is made aware of the fact.

"What is done with human and animal excremental matter?" Human, covered up as before stated, animal, hauled off to adjacent farms, and used as a fertilizer. We have no general method of utilizing human excremental matter; some few disinfect their privies with *cold* ashes, which works well, but is troublesome, as are all sanitary efforts.

Chicken coops are too often neglected, till they become a nuisance.

"What is done with house slops?" Some few have sink holes in the ground; some conduct into the gutter, where it runs off with the ditch water; many throw it out from the kitchen door, and, if in great quantity, it causes foul odors, and serves as a breeding place for flies, and a centre of infection.

"What is done with dry refuse?" It used to be allowed to accumulate, especially in the alleys, but the general clean up removed all that.

"From what source is your drinking water derived?" Primarily from the Boulder creek, which is fed by the melting snow on the range; the way the creek winds, the water flows about thirty-five miles to reach us, and falling about 5,500 feet, gives fresh melted snow, at the most, in seven hours, well aerated by innumerable cascades it passes on its way. This water is distributed to our people in three ways,—town water works, wells, and ditches. The location of our town at the mouth of the creek and cañon as they open into the plains, gives us ample facilities for water works, which at this date supply about one-half of our people. This water after heavy rain storms, is turbid and discolored by the washings of the feed ditch which runs along the mountain side about a mile, but this can easily be remedied by more care on the part of the person in charge, and by a filter at the head of the main. Some of our people have used common gas pipe for service pipes, but it discolors the water with iron rust and is a mistaken economy.

During the summer, the creek water is clear, but during the winter when the snows on the range melt but little, our creek is low, and the water as it reaches our people is, at times, quite milky in color, which has led many to think it contaminated with deleterious substances; my examination of it, shows it to contain six and one-half grains to a wine gallon; two and one-half of which would burn. Price's test fails to show contamination, as does the permanganate of potassa; letting the water stand a long time, then examining under the microscope, it fails to show contamination; hence, the inference is, that there is no dangerous organic substance in it. As to deleterious minerals, I made a rigid application of the approved reagents in qualitative analysis, and they failed to detect the presence of the dangerous minerals. The ordinary constituents of drinking water were present, such as carbonic and sulphuric acid, chlorine, potassa, soda, lime, magnesia and alumnia, which is believed to come from the powdered rock thrown into the water, principally by a tributary of the Boulder creek, called Four Mile creek. This brings us to the consideration of your question; "Is the source of your supply of drinking water above the receptacles of filth, washing of placer mines, or tailings of ore mills?" No; on the contrary, our reservoir is supplied from a feed ditch, the head of which is about two and one-half miles below the point where Four Mile creek empties into the Boulder. On Four Mile creek and its tributaries, there are several placer mines, the hamlets of Summerville, Salina, Crisman, and six mills, five for concentration, and one for concentration and reduction; some of these mills are always at work, and usually some of the placer mines are being worked. The tailings of mills cause the water to have a milk-like turbidity; this, mingling with the clear waters of the Boulder, of course becomes diluted, but as the specific gravity of this substance is so near that of the water, and the distance it runs before entering the feed ditch so short, there is but little opportunity for it to settle until it enters the reservoir, which catches considerable of it, but the lack of a filter permits a great deal of it to flow on into the mains, where it is distributed by service pipes to the people; that it affects the health of our people, I find no proof. The principle substance in this discoloration, I consider to be powdered mica. Boulder creek has four mills and three towns on its banks and tributaries; Caribou, Nederland and Magnolia; first two distant respectively twenty-four and twenty miles, the last, six miles; our town is at the outlet of the creek from the mountains, we have good soft, wholesome drinking water, and could at *all* times have it clear and sparkling, if a filter was put in to catch the powdered rock. The work of extending the mains to all parts of town, is to be immediately commenced, which will obviate the necessity of using well or ditch water.

I estimate that three-eights of our people use well water; this like our town water is derived fron the Boulder creek, through the medium of a vast bed of gravel and mountain detritus upon which the town is built; this gives free passage to the waters of the creek, and as the creek is high or low, so are the wells.

"Are the wells much affected by irrigation?" No; from the causes above mentioned, our creek does what is usually attributed to irrigating ditches.

"Do the wells usually dip into or go through beds of clay or slate which are impervious to water?" Not as a rule; no slate in this section, and only in a few places in town, is clay found, then, always close to the surface; but it is of a poor quality, hence it soon permits percolation of surface water, which generally results in transforming, by the end of the first year, the soft water which the wells invaribly furnish when first dug, into hard, and what is called "alkali" water, although we have numbers of wells that have retained their softness for years. Were it not for the fact of the mountain detritus over which our town stands being packed in places with large boulders, we could make drive wells, and obviate the trouble of the alkali surface water percolating in; as it is, we have two drive wells in use.

"Is there any rule enforced as to the distance at which wells should be located from privies, cesspools and slop holes?" No; and it is doubtful if you can safely use a well for a length of time in any town, because each well acts as a drain to an inverted cone, of from twenty to one hundred feet in diameter, and in a town, a lot usually contains a privy, chicken coop, sometimes a stable, (and where there are no sewers it should have a slop hole,) and as these are generally managed, one lot is not large enough to have a well in addition and use the water with safety.

We have the usual irrigating ditches running around our town, out of which about one-eighth of our people use the water for household purposes, and I have thought that such have more lingering and fatal sickness than those who do not; these ditches are patronized by cattle and chickens, catch surface water, are choked with all kinds of vegetable growth, are very warm in midday, and too often have a bad odor; household use of this water in our place should be forbidden, unless it be first boiled and filtered.

"Have endemic diseases, such as cholera infantum, diarrhœa, typhoid fever, etc., prevailed to any considerable extent in your vicinity?" "Have contagious diseases been intensified or made epidemic by water or air pollution?"

All the diseases specified have occurred in Boulder, but with the exception of an epidemic of scarlet fever hereafter to be mentioned, Boulder has never been visited with epidemics; diseases of the bowels are not frequent in this town, and when they do occur, considering the number of our people, are attended with but *very few* deaths. As to typhoid fever, such cases as occur in the older settled eastern states with those severe and well marked symptoms, I have failed to see. Our fever here is that variety of typhoid, known as mountain fever, and while it sometimes proves fatal, yet as a rule it is easily controlled, and the convalescence is rapid and perfect. We have no malaria, as is understood by that word in the ague district of the middle states. I am not aware that diphtheria has shown itself in our town; the few cases diagnosed as such are now conceded to have been scarlet fever. Rheumatism is occasionally seen. Puerperal diseases are no more frequent in this section than elsewhere. I never saw a case of worms in a child born in Colorado, but obstinate constipation is quite frequent in children here. Croup is quite rare. Pneumonia and bronchitis as compared with those diseases in the eastern and northern states, are but seldom seen; the same can be said of measles. From the fact of our population being mostly eastern people, we are subject in the main to the same class of diseases, yet they run a much lighter course, and when we consider that four out of five of the families in our town came here to improve the health of one or more of its members, we cannot but be surprised at the small mortality among our resident population.

Our town, settled in 1860, has been visited with but one epidemic, which was scarlet fever, in 1876 and 1877, yet its *mortality* was but one per cent. of the population (35), and its estimated cases ten per cent. of our population (350); it remained with us one year.

A close scrutiny of this disease shows it to have been endemic with us since 1873. Its culmination in an epidemic in 1876 and 1877 induced our authorities to give the town a thorough cleaning up in the fall of 1877, the disease abating. As to the effects of water supply upon this or any other disease, while my private opinion in common with that of the profession is, that water supply is often the prime factor in the dissemination of a disease, I have not been able to obtain any well authenticated cases in this town; in fact, I have seen diseases originate where the water supply was all that could be desired, and the air also, convincing me that personal filth often originates sickness, the individual being poison to himself, in spite of pure air and drinking water.

CHARLES AMBROOK, M. D.,
Health Officer.

BOULDER, COLORADO, December 31, 1877.

FROM CENTRAL CITY.

ALTITUDE: 8,300 FEET ABOVE SEA LEVEL.

CENTRAL CITY, November, 1877.

DR. F. J. BANCROFT, *President of the State Board of Health of Colorado:*

DEAR SIR: In reply to a series of questions addressed to me October 8th, I have the honor to make the following statement:

The towns of Nevadaville, Central City and Black Hawk, mentioned in the order of their position, from the point of greatest elevation downward, are all built on both sides of a series of ravines or gulches, and on the sides of mountains bordering the same. From a certain point in Central, the gulches draining Nevadaville district and that through Eureka are heavily flumed for a certain distance, the same flume continuing downward to North Clear creek at the foot of Main street, Black Hawk, almost uninterruptedly. A large and important portion of that town lies below this point, being drained by the creek just mentioned.

The natural water supply of the upper and middle portions of this district is extremely limited. Nevada gulch, sparsely watered at any time, is totally dry during a considerable part of the year. Eureka furnishes but little more, except during our ordinary summer rains, whilst the amount of drainage through Black Hawk is somewhat increased by the waste water from the heavy mines in that section. North Clear creek, traversing the greater portion of the town, is never a large stream, although swollen at times by freshets, and is heavily charged moreover with earthy and mineral matters from the numerous stamp mills occupying this entire district.

The three towns above mentioned have ordinances prohibiting the deposition of offensive and unwholesome refuse in any portions thereof.

The expense of removing such matters, however, devolves upon the individual property occupant. Consequently, in many points of the district, large amounts of organic material are exposed to putrefactive influences, there being but very few local sub-drains in existence.

I may here remark, in passing, that it is fortunate such minor drains are not in general use, for in the absence of water in abundance, such receptacles would inevitably become the foci of miasmatic disease.

Another result of the inoperative character of the ordinance is, that a large quantity of refuse of all kinds finds its way into our great flume, there to lie and rot in the absence of a body of water sufficient to sweep it away. We have had striking evidence of this during the past summer, so marked by the lack of heavy rains. The stench at many points was unbearable. Fortunately, one or two late showers and the melting of early snows abated this dangerous nuisance before any serious results ensued.

The well system, at one time our only source of water for drinking and domestic use, is, and for some years past has been, almost totally abandoned. Many wells which years ago furnished cool, palatable water, were found after a while to become entirely unfit for use. On the closest inquiry I can only learn of two in use in Central City, two or three in populous Black Hawk, and four in Nevadaville, where water is extremely scarce. Of these last, two are kept locked in the dry season, the quantity of water being much reduced at that time.

Plenty of good wholesome water is supplied to the communities of Central City and Black Hawk, drawn from reservoirs fed by inexhaustible springs, located half a mile and more beyond the respective towns. It is distributed by movable tanks, and is an extremely heavy item in the cost of living. Nevadaville is partly supplied from the wells and partly from spring water conveyed in barrels.

Of the few wells in use, the water is generally good, being cold and clear, in some cases soft, and in others impregnated more or less with iron, sulphur and probably other mineral substances.

As to the privy system, I can safely say that it is of the simplest, if not the most satisfactory character. By far the greatest number of privy vaults in the entire district, are very shallow excavations, without lining or curbing, many not over four or six feet in depth, the subjacent rock approaching very closely to the surface in most places, and blasting out being seldom reresorted to. The soil, however, is very porous, permitting free percolation in all directions, and stratifications of clay and slate are not found in the district. The drainage being very rapid, the solid residua do not accumulate very fast, and up to this period seem to have been almost entirely innocuous. The remarkably desiccating character of our rare atmosphere and prevailing winds, may account for this fact. Where the accumulation of these residues become inconveniently bulky, they are removed in many cases, at least in Central City, to places outside of the town, and buried. In many localities, I am assured, nothing more is done than to cover up the filled vault and excavate another at a convenient spot.

It should be mentioned here that a very large amount of excrementitious matter is deposited broadcast over waste, uninhabited parts of the country, by our very numerous class of miners; they using any convenient locality away from their homes, in preference to adding to the difficulties inseparable from the very limited conveniences there.

As to the question of endemic and epidemic disease, I can most confidently affirm that we have had none whatever, of a serious character, for some years.

Cholera infantum, by no means general at any time, has always been easily manageable, except in very rare cases. During the past exceptionally dry summer, there have been quite a number of cases of diarrhœa among adults, with two, or perhaps three, of severe choleroid, but no fatal results.

Every fall brings with it a few isolated cases of continued fever, easily manageable as a rule, apt to be followed with considerable debility, but recovering rapidly on transition to any part of the valley. Likewise from one or two, to perhaps double that number of cases of true typhoid or enteric fever.

On strict inquiry of the resident physicians, I can find records of but ten or eleven cases of this latter type, in the entire district during the last two years. This year, so far, but one has presented itself. The district I refer to, be it understood, comprises not merely the three towns so often spoken of, with their population of about six thousand souls, but a large extent of partially settled country radiating from them as a center. Out of this number of cases, I find recorded but two deaths, and this evidently must not be taken as establishing a ratio, the entire number of cases being much too small.

Of diphtheria, I have known but two cases, both in children, one fatal. Of scarlatina, five or six, two of which were fatal, in the same two years. Measles and whooping-cough invariably run a regular course. Small-pox, as yet, has not invaded this district.

In concluding this brief sketch, two facts, worthy I think of notice, may be mentioned:

In the summer of 1865, Central City had, perhaps, its densest population, with no enforcement of municipal sanitary regulations. In one or more sections of the town, large quantities of garbage were suffered to accumulate. That fall, following a summer of sultry mornings and showery afternoons, a very serious epidemic fever of low grade, burst forth, rapid in its course and very fatal. Statistics cannot now be obtained, and I am stating these facts from the descriptions of others, not residing here at that time myself. From that date up to 1874, every year brought with it well-marked cases of the same ataxic fever, although much less widely spread and more manageable. The great fire of May, 1874, swept completely the very ground I have referred to, even to the edge of the gulch. From that day to this, not one well-marked case of fever, of any type, in the main portion of the city has been known.

Finally, after more than ten years of observation, I am forced to the belief that, with an ample water supply traversing our main drain or flume, and more rigid enforcement of our sanitary laws everywhere, this important district would be perfectly free from endemic or epidemic malarial disease.

With great respect, yours, truly,

G. S. McMURTRIE, M. D.

FROM DENVER.

ALTITUDE: 5,224 FEET ABOVE SEA LEVEL.

DR. F. J. BANCROFT, *President State Board of Health:*

DEAR SIR—Your inquiries concerning the sanitary condition of Denver, and the means employed by the authorities for the maintenance of the health and cleanliness of the city, and for the prevention of disease, cover a large field, and call for information which could be accurately and satisfactorily obtained, only by the careful and systematic efforts of a local Health Board which, unfortunately, does not at this time exist in Denver.

That there is abundant need of such a Board cannot be questioned, when the present condition of the city is seen, and the pertinent inquiry contained in your letter, as to "what have Boards of Health or the local authorities done to keep your town in a good sanitary condition?" will require a somewhat extended answer.

If such answer should seem to reflect upon the management, or rather the mismanagement, which has characterized our municipal government for the greater part of the last eight years, its utter disregard of the commonest principles of sanitary laws, and of wholesome ordinances, which are still in force upon the city records—the filthy condition of our alleys, the cesspools overflowing with their fetid and poisonous contents, the privy vaults, where the accumulation of years is allowed to stand undisturbed, furnish excellent proofs that complaint cannot be too urgent, nor criticism too severe.

We have upon the city records—or had until quite recently—a chapter of ordinances governing the sanitary management of its affairs, which conferred ample powers upon the proper officers to enforce all necessary measures for the cleanliness of the city; the mayor, city physician and three citizens, constituting a Board of Health, whose special care was the sanitary management of the city, with a scavenger to carry out the orders of the Board. If this organization could act independently, it might be an efficient one for the purpose, but in view of the fact that the City Council reserved to itself the power of enforcing the directions and suggestions of the Board, and all expenses connected with the enforcement of the ordinances had to be allowed by the Council—there being no special fund for this work—the Board being placed in the position of an advisory body with no executive functions, or at least, no moral or financial backing,—its usefulness was not only curtailed, but virtually destroyed, since an appeal to the Council for the remission of a fine, or to avoid the abatement of a nuisance directed by the Board could easily be made and as easily granted. Efforts were made at various times by the Board, as well as by physicians and citizens, to have the city properly cleaned, but with poor success.

In 1876, Dr. Buckingham, then mayor, acting upon the principle that medical knowledge and experience was essential in such a Board, appointed three physicians of the city to act as members. The city was apportioned into four districts, each under the care of a member of the Board.

An attempt was made, not only to have the ordinary scavenging of the city more strictly performed, but, in addition to that: *First*—To prevent the use of old wells for privies, vaults and cesspools. *Second*—To close all wells where the water was manifestly polluted, and have Holly water substituted. *Third*—To have the privy vaults, cesspools and private drains so constructed and attended to, that the least possible damage might result therefrom.

This was the work undertaken, and a vigorous and persistent effort was made to accomplish it. But in addition to the opposition, which might naturally be expected from the owners of property, when a change would involve expense and not increase the income of their property, there was a want of co-operation, not to say an apathy on the part of the Council, which at once checked any progress in that direction.

Nevertheless, with the assistance of the chairman of the Council committee on health, who, as well as the mayor, was in sympathy with the work of the Board, and who rendered efficient service, the city was as thoroughly scavenged as could be done under the circumstances, and the year showed a good health record for the city. A better record still might have been made had the Board been allowed and sustained in closing *all* the wells in the lower part of the city—say on lower Fifteenth street, and on Wazee, Blake, Holladay, Larimer and Lawrence streets, from Tenth to Twentieth. There are still in that district many wells in use, the water of which is polluted and absolutely unfit for household use.

At the beginning of the present year, the City Council, by advice of the mayor, thought it expedient to repeal the ordinance creating a Board of Health; also that establishing the office of city physician; the mayor and a committee from the Council taking upon themselves the functions of these offices.

There has been, I believe, no material change touching the ordinances for the sanitary management of the city. As matters now stand, the cleaning of the city is left principally to chance and a kind Providence, which is all that stands between us and any epidemic that filth and neglect can engender or aggravate. Each property owner, his agent or tenant, is supposed to be competent to take care of his own property, and is virtually left to do so in his own way. The alleys and gutters are under the supervision of the street commissioner, who in the triple capacity of street commissioner, jailor and scavenger, has more than one man can properly attend to, with the means at his disposal.

The care of such cases of contagious disease as properly come under the control of the authorities, is "farmed out" to such persons as the mayor chooses to employ.

No adequate means of emptying cesspools or vaults is provided by the city, but several methods are employed, some good and some indifferent, but *all* expensive, ranging from $10 to $30 for each vault emptied. At the lowest price for which this service could be performed, if all the vaults in the city were properly cleaned, enough money would be expended each year to make a very fair beginning for a system of sewerage, which would do away with this expensive and troublesome outlay.

WATER SUPPLY.

Prior to the year 1871, the entire water supply of the city—with the few exceptions where ditch or river water was used—was obtained for domestic purposes from wells, sunk to a depth varying from ten to fifteen feet, near the Platte river or Cherry creek, to thirty-six or forty feet in the higher portion of the city; or, in other words, well water was obtained at, or near the level of the above mentioned creek. In some portions of the town, the wells were sunk into or through a soft and imperfect stratum of soapstone, but in most instances the water was found in a stratum of loose gravel, at nearly a uniform level, the water flowing in the same general direction as the waters of Cherry creek.

At the same time the privy vaults and cesspools were comparatively shallow, never probably reaching a depth sufficient to encounter the gravel in which the water was found, while the exceedingly dry and absorbent soil prevented much pollution of the ground, either laterally or vertically, and the limited supply of waste water, slops, &c., as compared with that which comes with a system of water works, was not sufficient to produce air or soil pollution to a dangerous extent.

In 1871, the "Holly system" of water supply being introduced, there arose an immediate necessity for ampler means for disposing of the waste water, and the wells in the localities where the Holly water was used, were, to a great extent, utilized for cesspools or privy vaults, with the natural effect of fouling all the wells below where they were located.

The location of the Water Company's reservoir or well, below where Cherry creek empties into the Platte, is not, perhaps, the best that could have been selected, yet tests do not as yet show any contamination, and with the care exercised by the company to keep the water pure, there need be no danger feared from that source for a long time in the future.

Should the city be supplied with an efficient system of sewerage, and Cherry creek be relieved of its office as a common drain, no contamination of the river ever need occur, above where the water works now stand.

Few cities are supplied so abundantly as is ours, with pure and wholesome water, and this being the case, there is no excuse for those who still insist upon using impure water. There are still in the lower portion of the town many wells in use, the water in which is unquestionably impure and dangerous.

Aside from the fact that in this locality the seepage from irrigating ditches and the surface water from rains will enter the wells from above, another source of danger is, that the stratum of gravel which carries the water to these wells, has itself been reached by wells further up in the city, and that these wells, now diverted from their original purpose as mentioned above, are pouring their liquid filth into the water which is being daily used for domestic purposes. This is not merely hypothesis, since the analysis of the water in these lower wells proves the existence of dangerous organic matter, and the health record of this portion of the city shows the legitimate results of their use. In the interest of the persons and families using this water, these wells should be closed, or their use for household purposes entirely prohibited.

PRIVIES AND CESSPOOLS.

There is no uniformity in the construction of vaults for privies, nor the receptacles for waste water and slops. In any part of the city all kinds can be found, from the primitive "sink hole," dug but two or three feet below the surface, with no lining at all, up to the capacious and expensive brick or cemented ones, and often, as has been stated above, many *old wells are in use for one* or the other purpose, sometimes for both vault and cesspool combined. *An ordinance* is extant prohibiting the use of wells for such purpose, but as it is my intention to report simply what the practice is in regard to these matters, and since the ordinances in relation thereto seem to be of little or no effect, I shall refer to the laws as seldom as possible, leaving the investigation of them to the curious student of ancient and forgotten lore.

WASTE PIPES AND HOUSE DRAINAGE.

In very many private residences and in our best hotels, every effort has been used, and much expense is yearly incurred, to protect the air in the buildings from contamination by the sewage. Yet after all the care and expense of building a costly receptacle for their sewage and with every device of the mason and plumber, it is too often but a costly trap for the breeding and dissemination of poisonous gases and disease germs.

When the sewage is retained about the premises in any receptacle for days and weeks in succession, especially during hot weather, and where such receptacle is connected by drain pipes with the rooms of the dwelling, no device of the plumber can secure the inmates against danger. The only safe plan is the immediate and constant removal of such sewage from the premises, and this can only be effected by a complete, thorough and general system of sewerage.

In many residences and stores where persons sleep, and especially over business blocks, where the rooms are used as tenements, no trapping is attempted at all, but the pipes run directly from the wash basins into the cesspool, and often into the vault, thus acting as a sort of escape pipe for the gases from the vault, to reach and diffuse themselves in the air of the apartments.

SURFACE DRAINAGE.

Few cities are more advantageously situated to secure easy and perfect surface drainage than is Denver. The natural slope of the land toward the west and north is such that irrigating ditches can be made available, with trifling expense, along both sides of the street, in every block in the city. These ditches furnish a cheap and easy means for carrying off the surface water from rains or snows. Some portions of the city are, however, not properly attended to, notably that portion of West Denver below Larimer street, a part of East Denver, along Cherry creek from Lawrence street to Colfax avenue, and certain localities on Curtis street beyond Twentieth street, as also Wazee street between Fifteenth and Eighteenth streets.

The fact that our irrigating ditches are running one season after another, with the water in near proximity to our houses, and that no detriment results, should not make us unmindful of the other fact, that stagnant and putrid water can and does do much mischief, and is always dangerous.

NUISANCES.

A brief allusion to some of the most obvious of these will be sufficient. Prominent among these are garbage and swill. The latter is taken by swill carts, where the housekeeper takes the trouble to empty it into casks or boxes, and leave it on the alleys, but by far the greater portion of it is thrown into alleys and left to decompose. The ordure from stables, the parings and refuse of vegetables, rotten fruit, eggs, poultry, fish and even meat, are among the "evidences of civilization," which can be found, almost any day, in a walk of a block through almost any of our alleys. Indeed some of these abominations, such, for instance, as a pile of old bones, or a half dozen dead fowl have lain so long in certain places, that they have become "monumental," a land mark so to speak, warning both by *sight and smell.*

PIGGERIES.

A city ordinance restricting the number of swine which shall be allowed in one pen, to seven, is, it would seem, sufficiently lenient; but, as if seven were not enough, some parties who wish to keep more, are in the habit of arranging several pens side by side, like the cells of a battery, thus concentrating the stench in a most remarkable and efficient manner.

SLAUGHTER HOUSES.

There are but one or two inside the city limits, but several are so near to the north side of the city, that the neighborhood in that locality is rendered disagreeable, and property is depreciated on that account. The prevailing winds being from the slaughter pens toward that portion of the city beyond Thirtieth street, brings the stench directly over the neighborhood, and the residents justly complain.

In connection with the subject of nuisances, I cannot forbear mentioning one or two others, which, although not insanitary in a strict sense, yet bear a close relation to sanitary topics, in as much as they imperil "limb," if not "life." I allude to the miscellaneous assortment of dangerous articles, which is thrown into the public thoroughfares. Among the most mischievous of these are old wires which have been used on baled hay, old tin cans, and barrel hoops. Few people whose business or pleasure calls them to drive upon the streets, but have had to stop to disengage some of these articles from the wheels of their vehicles, to say nothing of the discomfort to the pedestrian who, as is often the case at night, has to avoid the Scylla which besets him on the sidewalk, in the shape of holes, broken planks and protruding spikes, only to find a Charybdis in the street, in the shape of tin cans, wires, broken glass and barrel hoops.

EPIDEMICS.

The vital statistics show comparatively few deaths from diseases which are commonly considered epidemic, during the year ending December 31, 1877.

Of small pox, there have been during the year (1878,) few cases, and these have been mostly among transients; very few cases having been contracted from the original ones. Notwithstanding our city is in daily railroad communication with southern Colorado, where the epidemic was a most severe and fatal one, yet our whole number of cases did not exceed a dozen, and the number of deaths reported were but two.

SCARLATINA.

This disease has been so long in our midst, that for the last two years, it would seem almost as if it might be properly called endemic, it having been present in the city for some four or five years consecutively, but so far as my observation and inquiry have extended, we seem at last to have gotten rid of it, no case having come to my knowledge for some months. The type of the disease, especially among residents, for the last three years, has been very mild, even more so than on the ranches and in the settlements of the surrounding country.

DIPHTHERIA.

Sporadic cases of this disease have several times come under my observation. The first *(and among the first, if* not the first, ever known in this section of the State), being in the fall of 1875. Since then I have seen a few cases each year, and from my own observation, I believe it is becoming more common in our vicinity. Reports say that, at this writing (September 24,) it is epidemic and quite fatal in some of the mountain districts, especially in the new town of Leadville, in Summit county.

I have been led to believe that there may be something related, if not identical in the disease called "roup," in chickens, and diphtheria in the human.

I have a record of at least six cases, out of the limited number I have met with in Colorado, where diphtheria has occurred sporadically, and where no source of infection seemed to exist, except it came from the proximity of the living rooms of the family, to the yard and coops of the chickens.

In all these cases, the children had been in the habit of playing about the yard where the fowls were kept, and where the peculiar pungent odor of their excreta was very clearly recognizable. It is possible that scientific research might show this to be a possible, if not a common, source of contagion in this disease.

TYPHOID FEVER.

This endemic seems to me to be each year more nearly approaching the typical "enteric fever," of the older states and cities. Formerly, this was classed by practitioners here, with a species of remittent fever, known as "mountain fever," and I have reason to believe that in the earlier days of the settlement of this country, true typhoid was rare, the cases which did occur, being a species of mixed fever, in other terms a remittent fever, (which originates in malaria?) ending in a typhoid condition, or possibly in true typhoid. However this may have been, there can be no doubt that we now have the typical enteric fever, as one of the diseases of this city, and if the received theory of filth poisoning is the true one, there is no doubt but it has come to stay.

DIARRHŒA AND DYSENTERY.

These diseases, so troublesome in some of the older cities, seldom give us much trouble. Our proximity to the cool regions of the mountains, our cool nights, and the opportunities to take the patient into almost a winter climate, if need be, renders this city a very desirable place for the treatment of such diseases. The "summer complaint," or diarrhœa of infants, which is sometimes so troublesome, is very happily affected by a change from the plains to the mountains, hence the death rate from this scourge of infantile life is exceedingly small.

NEEDED IMPROVEMENTS.

I now beg leave to point out what I conceive to be some of the most urgent needs of our city. That the sanitary reforms which are so much to be desired, will be brought about in one or two years, or even in half a score of years, is perhaps too much to expect, but a beginning might and should be made at once.

SEWERAGE.

It is a well established fact that no city, having an abundant water supply, can be kept in good sanitary condition without some regular and comprehensive plan for disposing of its sewage. Dry earth closets, cartage, surface drains and cesspools, can perhaps be made to answer the purpose in towns where the water is obtained only from wells or cisterns, but when a system of water works is established in a town, be it large or small, then sewers *become a necessity,* and one that cannot be safely ignored.

The Holly works which supply Denver, throw into the town not less than 800,000 gallons per day during the entire year. Of this amount, at least three-fourths, or 600,000 gallons are used for purposes which render it foul water or slops, and this enormous amount is deposited in the city each day. A certain amount, probably not more than one per cent. of this, is conveyed from the city in the cleaning of cesspools and vaults, the remainder is left to find its way back into the water courses, or into the soil by slow absorption, leaving in its course all the solid and poisonous constituents, to pollute the soil and taint the atmosphere. Every year that this continues, adds so much to the death rate present and prospective.

Strenuous measures are taken by municipal authorities, to isolate cases of contagious disease, as small pox for example. Vaccination is made compulsory in certain instances, pupils from houses where scarlatina, measles or diphtheria is present, are properly excluded from the public schools or public assemblages, and yet the very privy vault of the public school or public hall, may be charged with disease germs, capable of producing results equally as disastrous as scarlet fever or measles; and the public house where a patient with small pox would not be allowed to remain a single hour, may have in its cesspool enough of the germs of typhoid fever to imperil the life of every guest who sits at its table.

The prevention of disease is of first importance, and when a whole class of diseases (I allude now to that class known as filth diseases,) can be prevented, or rendered comparatively rare by sanitary precaution, it is incurring a grave responsibility for a community or municipality to neglect it. If proof is needed to enforce this assertion, it is only necessary to look at the various invasions of diseases, such as yellow fever, Asiatic cholera and small pox, all of which find a congenial field in the filthiest quarters of cities, or in cities where cleanliness is neglected.

I do not propose to go into details in regard to cost or special plans of sewerage; abundant experience can be had from the older cities of the east, both as to cost and best plans for such work. I think, however, I am safe in asserting that this city is very favorably situated for the easy and efficient construction of sewers; that two of the streets running toward the river, say Fifteenth and Eighteenth streets, might be sewered from a point as high up as Welton street, both sewers terminating in a main, which might be laid along Wazee street or perhaps a little below, and this main be emptied into the river at the foot of Nineteenth or Twentieth streets; and, that this, while it would accommodate all the thickly settled portion of East Denver, would be a nucleus upon which a good system might be based, and which would grow with the needs of the city. This, with a good system of dry cartage, would answer a better purpose for keeping the city clean, than all the devices of odorless excavators, pumps, or disinfectants. Teams and drivers should be kept employed every working day in the year.

Each tenant should be obliged to keep a box, barrel or bin at the rear of his premises, accessible from the alley, where all sweepings and dry refuse which are now thrown into streets, alleys and vacant lots, should be deposited to be removed by the cartman on their weekly or semi-weekly rounds. The expense of this cartage should be borne by the city, and a strict performance of this duty should be enforced by the health officer. Should this plan for garbage removal be as strictly enforced as is the present plan for the removal of ashes, a very appreciable improvement would soon be apparent in the condition of the city.

BOARD OF HEALTH.

An independent Board of Health is one of the urgent needs of our city. Under the present management, no improvement need be expected. Members of the City Council are *not chosen* with a view to their fitness to serve the city in a sanitary capacity, and if they *fail to see and know* what their training or business has not taught them to see and know, we can hardly find fault with them for it. Yet the results are the same to the health and lives of the community, whether the omission comes from ignorance or neglect.

A Board of Health should have the power, both to decide and execute; and, if an appeal is taken from its decision, it should be to the courts and not to the Council. Then, with a moderate appropriation for expenses only, a Board might accomplish more in one year for the sanitary improvement of the city, than the City Council, with all the other burdens on its hands, could do in a lifetime.

Another duty of such a Board would be, the collection and compiling of statistics of vitality of the city, keeping an accurate list of births and deaths, with proper data; also, as far as possible, a record of diseases, both epidemic and endemic, their severity, locality and all other matters of interest in connection therewith. Such a Board could add much to our knowledge of the exact value of our city and state as a place of residence, and would furnish a remedy without additional legislation, for many of the evils from which we suffer.

CONCLUDING REMARKS.

Disease entails upon a community a much larger loss than the death list indicates, to say nothing of the suffering of the individual, or of families from preventable diseases. In a strictly utilitarian sense, no state or city can *afford* to allow any of the individual members composing it, to become a burden upon his friends, his family or the public, for a given number of days or weeks, if it can be prevented. Preventive medicine has already achieved much for the prolongation of life, and the prevention of diseases which imperil it; and step by step sanitary science has grown into importance, tracing out the causes of disease and pointing out the methods for their prevention. How to build, to drain, to ventilate, in short, how to *live*, are some of the questions which the sanitarian has to answer.

No advantage of climate, or situation can compensate for the neglect of sanitary laws and sanitary regulations. Wherever people crowd together in cities or towns, there the same conditions exist. Their external surroundings may modify these conditions, but they cannot abolish them.

The price paid by mankind for the luxuries, the refinements and the higher civilization wrought out and sustained by these great communities called cities, is the tax of an intelligent, vigilant and unceasing care, that not only should pure water and air be supplied, but, that whatever tends to breed disease or to impair health, should be excluded.

This duty, delegated by the citizens to their representatives in the municipal government, is no less binding than the enforcement of the laws against crimes, lewdness or immorality, and in its neglect is equally as deplorable and disastrous.

A. STEDMAN, M. D.

DENVER, COLORADO, September 28, 1878.

Dr. D. H. Dougan's paper is interesting to the profession, as coming from a town nearly 12,000 feet above sea level, and showing the remarkable freedom of its inhabitants from the zymotic diseases. It further shows that the cases of pneumonia were, with one exception, developed in the dirty part of Alma.

Dr. J. V. Jones, of Longmont, presents interesting facts in relation to the epidemic of scarlet fever in that place; those are especially important which refer to the second breaking out of the disease, caused by the cast-off clothing of scarlet fever patients, which had been carelessly left in a vacant building.

Dr. S. T. Floyd shows that no sanitary regulations have been enforced in Golden, and that, as a consequence, typhoid fever has been quite prevalent. Water is derived from wells, which must be polluted by seepage, yet the town is by no means an unhealthy one.

Dr. J. S. Prentiss, writing from Cañon City, one of the favorite health resorts of Colorado, states that the town is clean, and the resident population healthful. No stronger recommendation could be given for it as a desirable residence for invalids in search of health. The drinking water is derived from the Arkansas river, hence the remarkable exemption of the town from typhoid fever.

Dr. J. S. Scott's letter comes from one of our most thriving farming towns, and indicates what dangers may proceed from the rank growth of weeds in irrigating canals, and the lodgment of waste matter among them. The drinking water has been derived from wells. Typhoid fever has prevailed to a limited extent in Greeley, and, in the vicinity of Evans more generally, for several years.

Dr. Jacob Reed, of Colorado Springs, presents, in his very thorough paper, a careful mortuary record, which places the death ratio of the town for the last year, at the almost incredibly low rate of 5.6 per 1000 inhabitants. The establishment of the earth closet system is a move in the right direction, which I earnestly hope will be persevered in, not only at Colorado Springs, but also in Manitou, where the clear and sparkling little mountain stream which flows through the place, and thence to Colorado Springs, is polluted by all the sewage of the hotels, and by all the waste matter of campers thrown broadcast over the surface of the ground.

Manitou was evidently intended by nature as a resort for the invalid. It is accessible, beautiful, with strengthening climate and tonic springs, and for this reason I have felt much interest in the preservation of its healthfulness, and have been much pained to learn how little attention has been paid therein to sanitary laws. I have even been reproached by some of my intelligent patients for having sent them to such an insanitary place. No permanent harm may yet have been done, and I sincerely hope that the earth closet system will be adopted there, that garbage carts will be employed, and that strict ordinances will be enacted in reference to campers. This state and many other states have a deep interest in the wholesomeness of this lovely place, whose praises are sounded throughout America and England.

Dr. Chas. Ambrook's detailed account of the epidemic which prevailed in Boulder, possesses a sad interest which causes sincere commendation of the subsequent workings of the Town Board of Health, as explained in the same paper.

Dr. G. S. McMurtrie gives a very thorough report of the sanitary condition of Nevadaville, Central and Black Hawk, and of the source whence these towns are supplied with drinking water. The great exemption from typhoid fever in this vicinity, must be due to its supply of pure water.

I think a main sewer pipe, of earthen glazed ware, sufficiently large to carry off all house drainage, could be laid from Nevadaville to below Black Hawk, at an expense within the combined means of these places. This would prevent pollution of the stream, and much of the sickness which arises therefrom.

Dr. Stedman presents a very carefully written statement of what has been done by Boards of Health in Denver, of the city's present condition and the dangers arising therefrom, and of what is required to make and keep it healthful. I commend its perusal to all interested in sanitary advancement. His observations on the possible origin of diphtheria are worthy of further study.

In conjunction with what he states concerning the losses sustained by the city from sickness and death resulting from insanitation, I must add that they represent only a part of the annual loss from this cause. Estimating at three hundred the number of invalids who would be glad to avail themselves of the superior accommodations afforded by the hotels and boarding houses of Denver, and of its high order of religious, social and amusement privileges, if its sanitary condition would permit their remaining; and again estimating that each would spend $2.00 per day here, the average annual expenditure would amount to $219,000. Twenty-five per cent. of this sum would place a good system of sewers in Denver, and purchase all the garbage carts needed by the city.

The information to be derived in a general way from the above communications shows but little progress in the sanitary management of the towns and cities of Colorado. Boulder, after suffering from the evils of filth, has taken the lead in this matter.

It is a great wonder that the people of Colorado have been visited with so few death-bearing epidemics; the immunity has been owing to *our dry soil* and originally pure air, not to any human preventive agencies. But, as Dr. Reed truly says, " such protection must surely lapse with time."

How generally the air is becoming changed by filth, none can possibly say, but to all of the older residents, one proof of its pollution for miles around Denver is apparent. The time was, when, from the purity of the air, the dead bodies of horses, cattle, etc., so dried up with but little decay, that their mummied forms remained where they fell for months. At the present time putrefaction destroys every part excepting the bones, which are left to bleach in the sunshine. This change is probably produced by a great increase of putrefaction-cells, which have their birth-place mostly in the filth of human habitations. This condition of the atmosphere can be prevented in a great measure by the application of fecal, animal and vegetable waste matter in proper manner, and in proper quantities to the soil.

Countries of vast extent have been impoverished by the neglect of man to imitate the economy of nature, whereby she uses matter deleterious to the safety of one portion of her kingdom for the superior nourishment of another.

Prevention of the accumulation of waste matter, and its systematic application to the soil, will greatly decrease sickness, death, failure of crops, and the weakening thereby of national resources and vigor.

The waste and danger which are caused by the common privy pit, in the rural districts as well as in the towns and cities where they are used, demand our first attention. Every cesspool and vault where fecal matter is allowed to accumulate, should be abolished, and replaced by earth, or ash closet. This is best done in the farming districts by making a water-tight box of plank upon what is called a stone boat; this can be slid under the closet, and every day a little dry earth or ashes should be sprinkled over its contents. When it becomes full, or offensive, a horse should be attached to it, and it should be drawn out into the field, where the contents should be spread upon the soil. By the general adoption of this plan, well water would rarely be polluted, typhoid fever, dysentery, diphtheria, cholera infantum and kindred diseases would be much diminished.

Whenever a town or city attains sufficient size to have water works, a system of sewers should be introduced at the same time. It is a good plan to follow every water pipe with a pipe for drainage. The main sewer should be so laid that all sewage discharged by it could be utilized by irrigating canals. The water supply of the towns and cities of Colorado is, with few exceptions, excellent.

It will be noticed, from the above reports, that wherever the drinking water is derived from an unpolluted source, as from streams or springs, typhoid fever is rarely seen. A notable instance of this is found in Pueblo. The drinking water used in the town has always been derived from the Arkansas river; as a consequence the leading physician of Pueblo informs me that, notwithstanding the town is in a very filthy condition, he has seen but two or three cases of typhoid fever there during a period of twelve years.

Among stock raisers, drinking water is usually good, for their occupation necessitates the location of their dwellings near springs or running water, from which they derive their supply. But among farmers who employ irrigation, there is great danger; the overflowing of the land by so much water causes a continual seepage that reaches the wells, this fact being proven by the increased quantity of water in them during the irrigating season. When surface water gains ready access to wells, it is liable to carry with it organic matter from any feculent places that exist near by. Hence, words of warning on this subject cannot be too many, nor too earnest.

ANNUAL AND SEASONAL METEOROLOGICAL TABLE

FOR THE

SIX YEARS ENDING DECEMBER 31, 1877, AT DENVER, COLORADO; LATITUDE 39° 45′, LONGITUDE 105° 4′.

ALTITUDE, 5,269 FEET ABOVE SEA LEVEL.

BY SERGEANT JAMES A. BARWICK, UNITED STATES SIGNAL SERVICE.

	1872.	1873.	1874.	1875.	1876.	1877.	Mean of past six years.	REMARKS.
Mean annual barometer	24.800	24.788	24.781	24.773	24.773	24.767	24.780	The actual barometer is given as it is at Denver's
*Mean winter barometer	24.682	24.699	24.704	24.721	24.714	24.799	24.720	altitude. To correct it for elevation add to each
Mean spring barometer	24.732	24.735	24.736	24.725	24.699	24.663	24.715	height as given 5.22 inches, which will correct to
Mean summer barometer	24.871	24.859	24.845	24.847	24.833	24.812	24.844	sea level.
Mean fall barometer	24.844	24.849	24.823	24.833	24.819	24.791	24.826	
Highest mean barometer	24.904	24.906	24.892	24.923	24.870	25.141	24.940	
	August.	August.	Oct.	Sept.	Sept.	Feb.	....	
Lowest mean barometer	24.669	24.631	24.650	24.663	24.637	24.207	24.576	
	April.	Feb.	Feb.	March.	March.	April.	....	
Mean annual thermometer, F	47.86°	48.03°	50.04°	48.80°	49.72°	48.79°	48.88°	
*Mean winter thermometer, F	28.89	29.21	26.30	26.26	34.60	28.61	28.98	
Mean spring thermometer, F	46.75	45.71	47.03	46.03	46.94	47.84	46.72	
Mean summer thermometer, F	68.78	70.41	73.04	69.17	70.78	69.94	70.35	
Mean fall thermometer, F	47.53	48.53	51.37	51.03	50.11	47.13	49.28	
Maximum thermometer, F	95	99	102	97	101	99	98.84	
Minimum thermometer, F	—22	—17	—11	—29	—25	—18	—20.33	A dash, thus —, before a figure means below zero.

Range of thermometer, F	117°	116°	113°	126°	126°	117°	119.17°
*Maximum temperature for winter, F	66	62	62	68	66	68	65.33
Minimum temperature for winter, F	—22	—17	—11	—29	—3	—25	—17.83
Maximum temperature for spring, F	91	84	92	87	85	85	87.33
Minimum temperature for spring, F	10	10	12	1	3	. . . .	6.00
Maximum temperature for summer, F	95	99	102	97	101	.99	98.83
Minimum temperature for summer, F	43	42	40	38	38	39	40.00
Maximum temperature for fall, F	88	90	92	91	90	92	90.50
Minimum temperature for fall, F	7	—1	8	5	3	—18	—0.67
Mean annual humidity	. . . .	. . . .	49.60	46.30	41.70	46.4	46.0
*Mean winter humidity	. . . .	. . . .	57.60	53.10	41.00	59.0	52.7
Mean spring humidity	. . . .	. . . .	52.00	44.50	44.40	46.9	47.0
Mean summer humidity	. . . .	. . . .	42.53	43.47	39.29	35.3	40 1
Mean fall humidity	. . . .	. . . .	47.00	48.29	39.70	45.3	45.1
Annual rainfall (inches)	17.95	11.73	13.46	17.25	20.12	16.38	16.15
*Winter rainfall (inches)	1.28	0.66	1.90	1.15	0.91	4.00	1.65
Spring rainfall (inches)	7.54	3.40	4.62	4.57	11.59	6.47	6.35
Summer rainfall (inches)	6.41	5.65	5.24	6.72	4.29	3.56	5.31
Fall rainfall (inches)	2.94	1.78	2.06	4.39	2.22	3.26	2.78
Annual velocity of wind in miles	46.197	48.812	53.485	52 209	53.884	54.655	51.550
*Winter velocity of wind in miles	13.489	10.971	10.472	12.009	12.201	12.123	11.877
Spring velocity of wind in miles	15.252	13.823	14.606	16.323	16.089	15.003	15.183
Summer velocity of wind in miles	10.374	12.199	14.303	12.703	12.765	13.548	12 649
Fall velocity of wind in miles	9.582	11.480	13.404	10.623	12.749	14.082	11.986
Mean annual direction of wind	South.	South.	South.	South.	South.	South.	South.

A dash, thus —, before a figure means below zero.

For four years ending 1877.

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* The winter tables are for the winters of 1871–'72, 1872–'73' 1873–'74, 1874–'75, 1875–'76, 1876–'77.

ANNUAL AND SEASONAL METEOROLOGICAL TABLE—CONTINUED.

	1872.	1873.	1874.	1875.	1876.	1877.	Mean of past six years.	REMARKS.
*Mean winter direction of wind	South.	North.	South.	N. E.	South.	South.	South.	
Mean spring direction of wind	North.	North.	South.	South.	South.	South.	South.	
Mean summer direction of wind	South.	South.	South.	South.	South.	South.	South.	
Mean fall direction of wind	South.	South.	South.	South.	South.	S. E.	South.	
Number of days clear	138	153	143	125	168	153	147	
Number of days fair	152	155	161	172	143	141	154	
Number of days cloudy	76	57	61	68	54	71	65	
Number of days rain fell	74	48	63	79	62	82	68	
Number of days snow fell	37	42	37	40	44	38	40	

* The winter tables are for the winters of 1871–'72, 1872–'73, 1873–'74, 1874–'75, 1875–'76, 1876–'77.

WINDS.

IN

RELATION TO RAIN OR SNOW AND CLEAR WEATHER.

Months.	Winds most likely to be followed by rain or snow.	Winds most likely to be followed by clear weather.	Months.	Winds most likely to be followed by rain or snow.	Winds most likely to be followed by clear weather.
January	North, northeast, east	Northwest, west, southwest.	July	Northwest, north, northeast . .	West, southwest, south.
February	Northwest, north, northeast . .	Southwest, south, southeast	August	North, northeast, east	Southwest, south, southeast.
March	North, northeast, east	Northwest, west, southwest.	September	South, southeast, east	West, northwest, north.
April	North, northeast, east	Southwest, south, southeast.	October	South, southeast, east	Southwest, west, northwest.
May	North, northeast, east	West, southwest, south.	November	Northwest, north, northeast . .	Southwest, south. southeast.
June	Northwest, north, northeast . .	West, southwest, south.	December	Northwest, north, northeast . .	Southwest, south, southeast.

METEOROLOGICAL TABLE BY MONTHS, FOR YEAR 1877,

FOR

DENVER, COLORADO; LATITUDE 39° 45′, LONGITUDE 105° 4′. ALTITUDE, 5,269 FEET ABOVE SEA LEVEL.

BY SERGEANT JAMES A. BARWICK, UNITED STATES SIGNAL SERVICE.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly Mean.	REMARKS.
Monthly mean barometer	24.77	24.86	24.68	24.68	24.63	24.76	24.82	24.86	24.81	24.79	24.77	24.78	24.77	To correct the barometer to sea level add 5.22 inches to the height given in this table.
Highest barometer	25.12	25.14	24.96	24.98	24.88	25.07	25.05	25.04	25.06	25.08	25.06	25.13	25.05	
Lowest barometer	24.25	24.57	24.21	24.21	24.26	24.49	24.52	24.62	24.55	24.49	24.39	24.33	24.41	
Monthly range of barometer	.87	.57	.75	.77	.62	.58	.53	.42	.51	.59	.67	.80	.64	
Mean daily temperature, 5.43 a. m., F	17.5°	28.1°	33.7°	35.2°	46.7°	52.9°	61.3°	58.0°	50.2°	36.5°	27.5°	26.0°	39.50°	
Mean daily temperature, 2.43 p. m., F	34.0	43.8	52.5	51.8	65.8	76.5	85.5	83.2	73.8	54.2	45.8	43.0	59.16	
Mean daily temperature, 9.08 p. m., F	22.3	33.4	42.3	43.7	55.1	64.0	72.5	69.8	61.1	48.3	32.4	29.0	47.79	
Greatest daily range of temperature, F	55	31	48	40	38	44	44	45	45	44	38	41	42.75	
Least daily range of temperature, F	7	8	10	5	10	14	9	16	10	5	10	6	9.17	
Mean daily range of temperature, F	31.1	22.9	29.7	23.3	25.6	31.3	30.7	31.7	30.5	24.4	24.6	22.9	27.34	
Mean of maximum temperature, F	39.8	47.0	57.4	55.6	69.4	80.3	89.8	88.3	78.2	58.5	48.2	45.1	63.13	
Mean of minimum temperatnre, F	8.7	24.1	28.3	32.3	43.8	49.0	59.1	56.5	47.7	34.1	23.6	22.2	35.78	
Highest temperature during month, F	58	60	75	72	85	95	99	99	92	85	67	64	79.25	
Lowest temperature during month, F	-15	16	0	12	32	39	48	47	37	22	-18	—5	17.92	A dash, thus —, before a figure means below zero.
Monthly range of temperature, F	73	44	75	60	53	56	51	52	55	63	85	69	61.33	
Mean of temperature for entire month, F	24.1	34.5	42.8	44.2	56.5	65.1	73.8	70.9	61.9	44.7	34.8	32.0	48.80	
Mean actual humidity in grains per cubic foot for each month	1.09	1.53	1.50	1.80	2.35	2.67	3.00	3.00	2.42	1.79	1.37	1.29	1.98	

M'n monthly humidity, pr. cent. saturation	62.8	62.8	46.3	50.5	44.0	38.5	31.9	35.4	36.2	50.2	49.5	54.0	.46.85	
Prevailing direction of wind	South	South	South	South	South	South	South	N. W.	S. E.	S. E.	South	South	South	
Velocity of wind for month in miles	4.753	2.997	5.254	5.228	4.521	4.212	4.723	4.613	4.689	4.592	4.801	4.272	54.655	Total for year.
Maximum velocity of wind. Miles	40	36	48	60	38	38	48	75	42	48	50	60	48.6	Monthly mean for year.
Maximum velocity of wind. Direction	N. W.	N. W.	N. W.	N. W.	N. W.	N. W.	N. W.	N. W.	West	West	N. W.	N. W.	N. W.	Prevailing direction during year.
Clear days in month	16	16	12	11	8	16	16	9	17	12	10	18	153	Total for year.
Fair days in month	12	7	10	6	17	10	12	20	9	8	15	7	141	
Cloudy days in month	3	6	9	13	6	4	3	2	4	11	5	5	71	
No. of days on which rain or snow fell	8	6	12	12	14	7	13	13	6	12	7	5	115	
Amount of rain or melted snow in inches	1.90	0.40	1.40	2.77	2.30	1.93	0.33	1.30	0.38	2.15	0.73	0.79	16.38	

TABLE SHOWING THE ACTUAL AND RELATIVE HUMIDITY AT DENVER, COLORADO,

DURING EACH DAY OF THE YEAR 1877.

COMPILED BY DR. CHARLES AMBROOK, SECRETARY OF THE BOARD.

Days of the Month.	Jan.		Feb		Mar.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.	
	Daily Mean.		Daily Mean.		Daily Mean.		Daily Mean.		Daily Mean.		Daily Mean.		Daily Mean.		Daily Mean.		Daily Mean.		Daily Mean.		Daily Mean.		Daily Mean.	
	Grains per cubic foot.	Per cent. of Saturation.	Grains per cubic foot.	Per cent. of Saturation.	Grains per cubic foot.	Per cent. of Saturation.	Grains per cubic foot.	Per cent. of Saturation.	Grains per cubic foot.	Per cent. of Saturation.	Grains per cubic foot.	Per cent. of Saturation.	Grains per cubic foot.	Per cent. of Saturation.	Grains per cubic foot.	Per cent. of Saturation.	Grains per cubic foot.	Per cent. of Saturation.	Grains per cubic foot.	Per cent. of Saturation.	Grains per cubic foot.	Per cent. of Saturation.	Grains per cubic foot.	Per cent. of Saturation.
1	1.10	.55	1.46	.57	2.05	.83	1.34	.45	2.64	.58	2.16	.27	1.57	.15	2.25	.23	3.76	.54	1.68	.26	1.72	.62	1.22	.55
2	1.44	.80	1.61	.56	1.11	.67	2.09	.45	2.80	.73	1.91	.35	2.75	.29	3.70	.41	4.86	.85	1.12	.16	1.92	.68	1.25	.58
3	0.74	.30	1.30	.57	0.79	63	1.53	.39	2.31	.62	2.08	.27	1.43	.28	3.01	.34	3.61	.71	1.02	.18	1.77	.59	1.41	.58
4	1.44	.44	1.73	.76	1.02	.75	1.19	.27	1.54	.31	2.07	.29	1.66	.13	4.40	.80	3.95	.71	1.26	.33	1.66	.63	0.88	.53
5	1.66	.53	1.29	.66	1.04	.63	1.33	.25	2.44	.76	2.46	.35	2.83	.24	2.94	.30	3.78	.51	1.30	.31	1.82	.62	0.91	.54
6	1.77	.66	1.73	.72	1.43	.47	1.70	.44	2.22	.58	4.02	.49	3.32	.35	4.17	.50	3.18	.44	1.52	.33	2.00	.68	1.19	.44
7	0.84	.80	1.42	.61	1 34	.49	1.77	.35	2.06	.74	3.35	.78	3.39	.38	3.91	.59	2.45	.36	1.13	.26	1.01	.31	1.21	.52
8	1.08	.53	1.36	.72	1.06	.76	2.24	.58	2.22	.40	2.87	.73	5.02	.60	3.95	.50	3.24	62	1.23	.23	1.18	.52	1.34	.42
9	1.56	.45	1.32	.53	1.37	.73	2.41	.82	2.02	.32	2.53	.33	4.83	.58	2.57	.29	2.13	.33	1.56	.39	1.41	.49	1.73	.52
10	1.46	.44	1.10	.55	1.53	.40	2.21	.65	3.10	.57	2.13	.41	4.12	.54	2.89	.29	1.77	.20	1.05	.23	1.53	.41	1.42	.30
11	0.88	.94	1.37	.83	1.52	.29	2.41	.79	3.15	.75	2.99	.54	3.32	.40	3.35	.36	1.69	.14	1.21	.33	1.21	.39	1.19	.31
12	0.47	.73	1.46	.76	1.63	.40	2.05	61	3.24	.68	2.70	.36	3.87	.44	3.85	.50	2.53	.30	2.85	.58	1.62	.44	1.18	.39
13	1.00	.68	1.16	.60	1.18	.19	1.70	.50	3.16	.63	3.79	.56	3.42	.37	3.88	.51	3.02	.50	2.93	.84	1.68	.48	1.22	.46

14	1.41	.67	1.47	.57	1.26	.31	1.90	.39	1.72	.33	3.39	.39	1.93	.30	3.95	.55	3.84	.31	2.29	.78	1.49	.49	1.56	.38
15	1.71	.84	1.87	.82	1.47	.27	1.51	.28	1.86	.28	3.69	.58	2.90	.42	3.46	.46	3.01	.30	2.32	.78	1.30	.33	1.34	.42
16	0.95	.55	1.52	.74	1.38	.39	1.58	.35	2.77	.48	3.27	.36	3.27	.44	2.49	.29	2.22	.44	2.33	.78	1.42	.29	1.75	.46
17	0.87	.72	1.45	.58	1.06	.21	2.29	.71	1.47	.22	1.39	.15	3.59	.36	2.31	.35	1.61	.30	1.95	.50	1.74	.39	1.79	.53
18	0.93	.83	1.34	.48	1.11	.18	1.41	.49	1.46	.22	4.57	.61	3.63	.52	2.63	.30	1.58	.25	1.92	.63	1.60	.66	1.42	.50
19	1.15	.52	1.49	.50	1.63	.36	2.03	.50	1.88	.31	3.24	.36	3.20	.45	3.28	.36	0.86	.15	2.24	.83	1.34	.51	1.63	.56
20	0.87	.77	1.68	.42	1.11	.28	1.46	.27	1.66	.25	3.09	.39	3.45	.43	3.01	.41	1.04	.11	1.79	.68	1.03	.38	1.82	.62
21	0.83	.74	1.33	.37	0.92	.19	0.87	.11	2.87	.44	3.13	.34	3.24	.43	2.15	.33	1.78	.19	2.05	.50	1.34	.62	1.61	.59
22	0.60	.82	1.25	.48	1.32	.26	1.63	.56	4.05	.64	1.92	.24	2.49	.35	3.17	.47	1.93	.27	2.32	.45	1:03	.34	1.27	.53
23	1.03	.69	1.61	.54	1.97	.86	1.88	.59	3.51	.54	1.88	.27	2.73	.38	1.65	.20	2.42	.35	1.89	.44	1.35	.34	0.95	.37
24	1.00	.69	1.77	.57	1.67	.50	2.10	.69	3.77	.59	2.42	.31	3.27	.44	1.56	.15	2.67	.37	1.92	.50	0.87	.28	1.18	.38
25	1.03	.65	1.94	.89	2.03	.42	2.35	.90	2.80	.56	2.28	.30	4.08	.44	1.64	.18	2.74	.51	1.70	.39	1.16	.35	1.30	.66
26	0.94	.48	2.10	.86	1.80	.32	2.21	.93	2.40	.39	3.18	.47	3.04	.35	2.50	.26	1.30	.18	1.78	.35	1.54	.72	1.65	.81
27	0.91	.51	1.92	.75	2.35	.50	1.84	.70	2.02	.28	2.72	.34	3.03	.41	3.64	.35	1.79	.31	1.58	.54	0.92	.63	1.37	.79
28	1.11	.52	1.82	.70	2.66	.62	1.69	.62	1.75	.20	2.84	.30	2 67	.37	2.80	.27	1.39	.16	2.13	.82	0.98	.61	1.04	.67
29	1.42	.51	. . .	. . .	2.41	.49	1.53	.60	1.18	.11	0 74	.06	1.42	.25	2.38	.26	1.10	.14	1.92	.65	0.52	.63	0.78	.75
30	1 48	.53	. . .	. . .	2.35	.51	1.83	.61	1.42	.20	1.49	.16	2.02	.27	2.57	.34	1.50	.25	1.69	.73	0.80	.57	0.68	.76
31	1.50	.57	. . .	. . .	1.21	.39	. . .	. . .	1.41	.22	. . .	. . .	1.39	.31	2.93	.35	. . .	. . .	1.85	.78	. . .	. . .	0 61	.67
M'thly Mean,	1.09	.62	1.53	.63	1.50	.43	1.80	.51	2.35	.44	2.67	.38	3.00	.40	3.00	.35	2.42	.36	1.79	.50	1.37	.49	1.29	.54

The above table is based upon the values given in the table of relative humidity, vapor tension, dew point, and actual humidity prepared by the United States Signal Service.

The mean barometrical pressure for the past six years at Denver was 24,780 inches.

The mean difference between wet and dry bulb thermometers is 8.5 degrees Fahr., or by seasons, it is for spring, 9 degrees; for summer, 12 degrees; for fall, 8 degrees; and for winter, 5 degrees.

As the signal service table was carried out but two decimal figures, the following constant additive correction to the vapor tension of each tri-daily observation, was used as being the nearest applicable to the respective seasons, for spring, 0.02 inches; summer, 0.02 inches; fall, 0.02 inches; winter, 0.01 inch, which it was thought would bring the actual humidity sufficiently close for all medical purposes.

The relative humidity was not corrected for the decreased barometrical pressure, but remains as given in the signal service table, which is practically Professor A. Guyot's extended to meet a greater range of the dry bulb thermometers.

TABLE OF OZONE OBSERVATIONS IN COLORADO,

ATIONS WITH METEOROLOGY AND ALTITUDE, COMPILED BY DR. CHARLES AMBROOK, FROM OBSERVATIONS TAKEN AT DENVER, BY SERGEANT JAMES A. HA-WICK, AND AT PIKE'S PEAK AND COLORADO SPRINGS BY SERGEANT CHARLES M. HOBBS, UNITED STATES SIGNAL SERVICE.

		Pike's Peak, 1876. Altitude, 14,151 feet.				Colorado Springs, 1876. Altitude, 6,032 feet.			Denver, Altitude, 5,269 feet.¶ 1876.						
		June‡	July.	Aug.‖	Mean.	June§	July.	Mean.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Daily mean of ozone with test slip exposed from	7 a. m. to 2 p. m. . . .	1.88	1.48	1.56	1.64	2.07	2.00	2.03	3.93	3.61	4.09	2.43	1.48	1.53	1.26
	2 p. m. to 9 p. m. . . .	1.22	1.53	1.17	1.30	2.07	1.51	1.79	1.56	1.35	2.19	1.43	0.97	1.30	1.10
	9 p. m. to 7 a. m. . . .	2.50	1.63	1.47	1.87	2.00	1.67	1.83	1.76	1.22	1.32	1.03	0.74	1.27	1.16
Extremes or range during the month	Maximum	4	7	3	4.66	3	5	4	9	6	6	5	3	3	3
	Minimum	. . .	. . .	. . .	. . .	1	. . .	0.5	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Mean of ozone from all observations during month		1.84	1.64	1.41	1.63	2.04	1.73	1.88	2.42	2.06	2.53	1.63	1.06	1.37	1.17
Weather. Days without either rain, hail or snow falling.	Number of such days .	. . .	12	8	9	. . .	19	. . .	19	18	18	19	27	22	23
	Daily mean of ozone .	. . .	1.50	1.21	1.35	. . .	1.59	. . .	2.33	2.05	2.50	1.33	1.00	1.21	0.96
Days on which either rain, hail or snow fell.	Number of such days .	. . .	19	15	17	. . .	12	. . .	11	13	13	11	4	8	8
	Daily mean of ozone .	. . .	1.73	1.29	1.50	. . .	1.94	. . .	2.54	2.07	2.59	2.15	1.50	1.79	1.79
Mean of ozone when each separate observation showed the weather during the time the test slip was exposed to have been—	Clear	. . .	1.37	1.59	1.43	. . .	1.57	. . .	2.18	1.74	2.19	1.25	0.83	1.19	0.97
	Fair	. . .	1.61	1.15	1.38	. . .	1.73	. . .	2.30	2.21	3.68	1.93	1.27	1.43	1.25
	Foggy or cloudy	. . .	1.90	1.53	1.71	. . .	1.75	. . .	3.00	2.91	2.27	1.66	1.07	1.23	1.40
	Thunder, lightning, rain, hail, or snow	. .	2.23	1.50	1.86	. . .	2.57	. . .	2.71	2.07	2.00	2.38	2.50	2.08	2.33
	Clear and fair*	. . .	1.46	1.35	1.40	. . .	1.64	. . .	2.21	1.84	2.93	1.59	1.01	1.25	1.00
	Fog, rain, clouds, hail, thunder, lightning, snow*	. . .	2.08	1.52	1.80	. . .	2.05	. . .	2.92	2.50	2.13	2.02	1.16	1.52	1.84

Relative humidity.	Daily mean relative humidity	. . .	.57	.65	.61	. . .	.48	. . .	.37	.39	.42	.42	.33	.46	.51
	Mean of ozone for those days having the— Greatest mean relative humidity†	. . .	2.00	1.00	1.50	. . .	1.86	. . .	2.86	2.51	2 64	1.75	1.26	1.31	1.47
	Mean of ozone for those days having the— Least mean relative humidity†	. . .	1.33	1.04	1.78	. . .	1.71	. . .	1.95	1.62	2.44	1.51	0.84	1.20	0.89
Actual humidity.	Daily mean actual humidity in grains	. . .	1.80	. . .	. . .	. . .	4.11	. . .	. . .	3.47	. . .	. . .	. . .	. . .	. . .
	Mean of ozone for those days having the— Greatest mean actual humidity	. . .	1.86	. . .	. . .	. . .	1.84	. . .	. . .	2.51	. . .	. . .	. . .	. . .	. . .
	Mean of ozone for those days having the— Least mean actual humidity	. . .	1.44	. . .	. . .	. . .	1.60	. . .	. . .	1.60	. . .	. . .	. . .	. . .	. . .
Barometer.	Daily mean barometer in inches	17.936	18.066	18.020	18.004	24.196	24.153	24.174	24.833	24.833	24.836	24.870	24.776	24.812	24.771
	Mean of ozone for those days having the— Greatest mean barometrical pressure†	. . .	1.71	1.54	1.62	. . .	1.82	. . .	2.75	2 29	2.42	1.48	1.13	1.29	1.11
	Mean of ozone for those days having the— Least mean barometrical pressure†	. . .	1.60	1.30	1.45	. . .	1.57	. . .	2.08	1.82	2.64	1.77	0.98	1.44	1.11
Temperature.	Daily mean temperature	. . .	42°	39°	40.50°	. . .	72°	. . .	66°	76°	71°	61°	72°	37°	27°
	Mean of ozone for those days having the— Greatest mean temperature†	. . .	1.55	1.42	1.48	. . .	1.82	. . .	1 88	1.80	2.33	1.64	1.02	1.29	0.91
	Mean of ozone for those days having the— Least mean temperature†	. . .	1.66	1.33	1.49	. . .	1.62	. . .	2.95	2.31	2.66	1.60	1.07	1.44	1.47
Winds.	Daily mean velocity in miles	. . .	305	311	308	. . .	177	. . .	146	134	133	114	146	160	141
	Mean of ozone for those days having the— Greatest velocity†	. . .	1.62	1.33	1.47	. . .	1.64	. . .	2 75	1.80	2.46	1.62	0.98	1.29	1.18
	Mean of ozone for those days having the— Least velocity†	. . .	1 68	1 39	1.53	. . .	1.80	. . .	2.11	2.35	2 66	1.64	1.15	1.44	1.16

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* Clear and fair weather being so closely allied, it was thought best to show them consolidated into one line, in contradistinction to the weather where fogs, clouds, thunder, lightning, rain, hail, and snow occurred, which is also consolidated.

† It was found that the "daily mean relative humidity," when used to divide the month into days of greatest and least relative humidity, did not divide the month into equal portions, consequently a table was made of the days of the month in the *order of their greatest relative humidity*, and the table divided into equal portions, the upper half being those days on which occurred the greatest relative humidity, was calculated as follows: the sum of all the ozone on the days of the month indicated, was divided by the number of ozone observations taken on those days, and the result was accepted as the "mean of ozone for those days having the greatest relative humidity," the lower half of the table, which contained the days having the least relative humidity, was calculated the same way. In those months having an odd day the plan was tried of dividing the ozone for that day, and again, of giving the morning observation to the upper half, the evening to the lower half of the table, and dividing the midday observation equally between upper and lower half, but it was found to be better to throw out the odd day entirely, the results being practically the same. The same rule was observed in computing the actual humidity, barometrical, temperature, and wind lines.

‡ Ozone observations only taken for the last eighteen days of this month.

‖ Ozone observations taken for the last twenty-three days of this month.

§ Ozone observations taken for the fourteen days commencing the 11th and ending the 24th inclusive.

¶ At the establishment of the signal station the barometer was placed at a height of 5,148 feet above sea level. In July, 1877, it was changed to 5,162 feet; in September, 1877, 5,269 feet.

TABLE OF OZONE OBSERVATIONS IN COLORADO—CONTINUED.

	Denver, Altitude, 5,269 feet.¶												
	1877.												Mean for nineteen months.*
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
Daily mean of ozone with test slip exposed from 7 a. m. to 2 p. m.	1.41	1.00	1.32	2.03	2.54	2.43	2.00	2.25	1.60	1.22	1.00	1.09	2.10
Daily mean of ozone with test slip exposed from 2 p. m. to 9 p. m.	1.00	0.60	1.00	1.63	1.77	1.63	1.16	1.29	0.76	1.00	0.62	0.22	1.18
Daily mean of ozone with test slip exposed from 9 p. m. to 7 a. m.	1.16	0.64	1.38	1.80	2.29	1.96	1.03	0.96	0.96	1.22	1.13	0.41	1.23
Extremes or range during the month—Maximum	5	2	5	9	8	10	3	4	6	5	4	3	5.21
Extremes or range during the month—Minimum	. . .	. . .	. . .	1	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.05
Mean of ozone from all observations during month	1.19	0.75	1.12	1.82	2.20	2.01	1.39	1.49	1.11	1.15	0.92	0.61	1.47
Weather. Days without either rain, hail or snow falling. Number of such days	22	22	20	19	17	23	18	18	24	20	23	27	21
Weather. Days without either rain, hail or snow falling. Daily mean of ozone	0.95	0.86	0.86	1.47	1.87	1.59	1.28	1.22	0.83	0.70	0.74	0.42	1.27
Weather. Days on which either rain, hail or snow fell. Number of such days	9	6	11	11	14	7	13	13	6	11	7	4	9.36
Weather. Days on which either rain, hail or snow fell. Daily mean of ozone	1.77	1.05	1.75	2.42	2.59	3.38	1.56	1.87	2.22	1.97	1.50	1.91	2.02
Weather. Mean of ozone when each separate observation showed the weather during the time the test slip was exposed to have been—Clear	0.79	0.46	0.88	1.14	1.76	1.38	1.23	1.17	0.59	0.75	0.78	0.36	1.14
Fair	1.27	0.78	1.05	1.47	1.87	1.73	1.56	1.41	1.06	0.50	0.64	0.72	1.48
Foggy or cloudy	1.90	1.26	1.13	1.88	2.47	2.37	1.57	1.88	2.30	1.20	1.11	0.58	1.74
Thunder, lightning, rain, hail, or snow	2.38	1.16	2.40	3.09	2.76	4.45	1.66	1.93	2.44	2.21	1.88	2.12	2.35
Clear and fair*	0.87	0.54	0.94	1.25	1.82	1.49	1.31	1.27	0.70	0.69	0.73	0.45	1.25
Fog, rain, clouds, hail, thunder, lightning, snow*	2.17	1.24	1.63	2.56	2.65	3.22	1.61	1.91	2.36	1.81	1.37	1.20	1.99

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Relative humidity.	Daily mean relative humidity	.62	.62	.42	.50	.44	.38	.32	.35	.36	.50	.49	.54	...	.47
	Mean of ozone for those days having the— Greatest mean relative humidity†	1.33	1.02	1.66	2.13	2.44	2.40	1.46	1.86	1.66	1.93	1.11	0.88	...	1.
	Mean of ozone for those days having the— Least mean relative humidity†	1.11	0.47	0 84	1.40	1.95	1.66	1.37	1.19	0.55	0.40	0.73	0 37	...	1.18
Actual humidity.	Daily mean actual humidity in grains	1.09	1.53	1.50	1.80	2.35	2.67	3.00	3.00	2.42	1.79	1.37	1.29	**Mean for y'r 1877.**	1.98
	Mean of ozone for those days having the— Greatest mean actual humidity	1.26	1.00	1 04	2.15	2.69	2.29	1.51	1.77	1.71	1.77	1.04	0.62	ditto	1.57
	Mean of ozone for those days having the— Least mean actual humidity	1.22	0.50	1.46	1.55	1.71	1.77	1.29	1.20	0.51	0.49	0.80	0.62	ditto	1.09
Barometer.	Daily mean barometer in inches	24.770	24.856	24.677	24.679	24.663	24.758	24.818	24.861	24.813	24.786	24.774	24.783	...	24.787
	Mean of ozone for those days having the— Greatest mean barometrical pressure†	0.84	0.47	1.11	2.11	2.64	2.13	1.46	1.73	1.44	1.09	0.95	0.55	...	1.52
	Mean of ozone for those days having the— Least mean barometrical pressure†	1.46	1.02	1.33	1.08	1.64	1.88	1.33	1.28	0.77	1.13	0.91	0.55	...	1.38
Temperature.	Daily mean temperature	24°	34°	42°	44°	56°	65°	74°	71°	62°	45°	35°	32°	...	52°
	Mean of ozone for those days having the— Greatest mean temperature†	1.13	0.71	0.82	1.22	2.42	1.11	1.33	1.33	0.91	0.51	0.93	0.40	...	1.25
	Mean of ozone for those days having the— Least mean temperature†	1.26	0.78	1.68	2.46	1.93	2.91	1.42	1.71	1.48	1.86	0.91	0.84	...	1.72
Winds.	Daily mean velocity in miles	153	107	169	174	145	140	152	1.48	156	148	160	138	...	145
	Mean of ozone for those days having the— Greatest velocity†	1.53	0.52	1.22	2.35	2.64	2.66	1.44	1.64	0.95	1.24	1.06	0.57	...	.57
	Mean of ozone for those days having the— Least velocity†	0.93	0.92	1.20	1.28	2.51	1.46	1.40	1.51	1.26	1.06	0 77	0.66	...	

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*These nineteen months include the seven for the year 1876, on the preceding page, and the twelve for the year 1877, on this page, which were originally intended to be printed on one sheet.

OZONE.

BY CHARLES AMBROOK, M. D.

Ozone has received the attention of our Board from the date of its organization. Dr. Lemen, the secretary at that time, prepared blanks for the recording of meteorological and ozone observations, and secured the co-operation of Sergeant James A. Barwick, in charge of the United States signal service station at Denver, who commenced taking observations for the Board, June 1, 1876, and has continued them to the present time. Sergeant Charles M. Hobbs, in charge of signal station at Colorado Springs and Pike's Peak, also assisted the Board, commencing the observations at the same time, but unfortunately discontinuing them in August, of the same year; however, thanks to these gentlemen, and the U. S. signal service, the end of the year 1877, finds the Board in possession of twenty-four months' observations; nineteen of them being consecutive reports for Denver; two for Colorado Springs, one complete, and one for part of a month; three for Pike's Peak, one complete, and two incomplete. These have been so tabulated that, at a glance, the relations of ozone to every variety of weather, time of day, high and low, relative and actual humidity, barometer, temperature and wind can be seen. It was thought that this would be a good method of placing the observations upon record, as well as assist in arriving at definite conclusions. By an examination of the table, it is readily seen that the maximum of ozone, invariably accompanies stormy weather, and as a rule, high relative and actual humidity, high barometer, low altitude, and relatively to the season, low temperature, and at the mid-day or from 7 a. m. to 2 p. m. observation. And that a minimum of ozone is found most generally with clear, fine dry weather, and relatively to the season, a high temperature, high altitude, low barometer, relative and actual *humidity*, and more often with a low amount of wind.

Of course there are exceptions to the above deductions, as based upon these twenty-four months' observations, as follows:

To the maximum of ozone being found at the mid-day observation, (7 a. m. to 2 p. m.,) the exception occurred at Pike's Peak, during the months of June and July, 1876; and at Denver, in 1877, months of March and November, being sixteen per cent of the observations.

To the maximum of ozone accompanying a high relative humidity, but one exception: August, 1876, at Pike's Peak, being four per cent.

Maximum of ozone with high actual humidity, but one exception in fifteen months' observation, occurring in March, 1877, at Denver; being nearly seven per cent.

Maximum of ozone with high barometer, seven exceptions: August, September and November, 1876, and January, February, March, and October, 1877, all at Denver; nearly thirty-two per cent. of the twenty-two months' observations.

Maximum of ozone accompanying a (relatively to the season,) low temperature, five exceptions: August, 1876, at Pike's Peak, July, 1876, at Colorado Springs, and September, 1876, at Denver; and, May and November, 1877, at Denver; being nearly twenty-three per cent.

Maximum of ozone found in low altitudes, no exception; yet, as the observations on that point for comparison with Denver, were limited to three months at Pike's Peak, and two months at Colorado Springs, they are not by any means conclusive, although quite strong, especially if we take into consideration the fact, that at Pike's Peak the air is not contaminated by coal smoke, and the organic impurities of a city like Denver; the same remark holds good in regard to Colorado Springs.

As to seasons of the year, the Denver observations show a mean of 2.00 for summer, 1.71 for spring, 1.20 for fall, and 1.03 for winter; which, as far as they go, indicate that a low temperature is not favorable to the formation of ozone, yet an element of error may exist, from the fact that there is more coal smoke in a city in winter than in summer; and on the contrary, there are less organic emanations to contaminate the air in winter than in summer.

We find that of any single observation, the greatest amount of ozone was registered during the summer months, as can be seen by reference to the line marked "extremes of range."

It is not to be presumed that these twenty-four months' observations will give all the data from which general laws can be deduced. A careful research of the literature at my command, has impressed me with the belief that the "Ghost that Schonbein raised," will not be so easily laid, for a more contradictory set of results from apparently equally competent observers, is hard to find, than is on record about ozone.

Sergeant Meyer, U. S. signal service, on duty with the Polaris expedition to the Arctic regions in 1871-2, reports: "Observations were made daily, no ozone was obtained on our voyage north, more or less noted at winter quarters, and some on our voyage south; at winter quarters, and during the winter the greatest amount of ozone was observed with north-east winds, and especially with heavy snow-drifts. During the summer, ozone was very abundant, and decreasing in the fall." If there is any one thing that observers agree upon, it is that ozone accompanies moisture; yet here are observations taken on a vessel, watery vapor all around, and "No ozone obtained on the voyage north."

In the Agricultural Department report upon forestry, we read that ozone was found to be most "perceptible in winter and least in summer." Dr. Kedzie, in his very valuable article on ozone agrees with this. Colorado observations show the contrary, Sergeant Meyer's report agrees with Colorado observations. Dr. Kedzie's observations in Michigan, show it to be more abundant during the night; in Colorado it is during the day. Bavarian observations show it to be most perceptible in the higher altitudes; Colorado's in the lower. Fox speaks of the highly ozonized exhalation of the coniferæ. Dr. Ebermayer found no difference between evergreens and desiduous forests. Fox says, "the influence of the vicinity of forests and vegetation is to increase it;" other observations (in Europe,) show less ozone in forests than at their borders. Some observers think that wind increases ozone; our observations show it has but little influence.

The American Cyclopœdia states that fog is not favorable for the formation of ozone; what few fogs we have in Boulder, are generally accompanied with an excess of ozone.

It is hardly possible that these observers were mistaken in their conclusions, yet they are contradictory in the extreme; may there not be some factor necessary to the formation of ozone, whose presence, or absence has been overlooked? I believe there is, and that it is necessary to record its amount and intensity, during the exposure of the test slip, in order to fully understand the absence or presence of ozone; all observers agree that the maximum of ozone is found during stormy weather, with hail and snow especially; moisture is increased during storms, so is electricity. Laboratory experiments prove that *ozone can be* generated by electricity from oxygen, air, and water, also that all vital and chemical action generates electricity; then why may not ozone depend upon the electrical conditions of the atmosphere? Feeble electric currents generate but small quantities of ozone, which is probably consumed by the organic and inorganic contaminations of the air, leaving but little or none to act upon the test slips; on the contrary, with strong electric currents in the atmosphere, as are known to exist during storms, an abundance of ozone is invariably present. Certain it is, that during the clear fine dry weather, such as Colorado is noted for having, ozone is extremely light, or entirely absent; let it cloud up, a fog, rain or snow occur, and the test slip at once indicates an increase of ozone; but let the storms rage on the snowy range, which towers up from 5,000 to 8,000 feet above us, and its air currents sweep down to our town, instead of keeping in the upper strata as they generally do, and an excess of ozone is at once shown by the test slip to be present. There is no trouble in knowing when our ozone generator is at work.

Sergeant Meyer, with the Polaris expedition, found no atmospheric electricity during the winter, in Thank God Harbor, and but little ozone, and then mostly during north-east storms and heavy snow-drifts.

Prof. Charles Richardson writing from Alma, Colorado, elevation 10,254 feet, says:

> When the atmosphere is heavily charged with electricity, the ozone begins to show its presence. * * * * * I can predict with almost unerring certainty, when we are going to have either a partial or protracted snow storm; temperature has nothing to do with it, for the accumulation of ozone is just as heavy with the mercury at 10° F. below zero, as it is when 75° above. * * * * * Ozone is not uniformly disseminated through the air; I have proved that its greatest density is confined to certain air strata, or currents varying from five hundred to one thousand feet in depth; my observations have been confined to an altitude of 10,000 to 13,250 feet above sea level.

Personally I am satisfied that ozone reaches Boulder in waves or currents, and I am inclined to the belief that electricity is the cause of its presence, but whether an electroscope and electrometer would prove the presence of electricity in great abundance during the excess of ozone, observations with those instruments will tell; even the absence of atmospheric electricity would be no proof that it was not the prime factor in the generation of ozone, because the electricity may have been used up in the production of ozone, and the air currents disseminate it at a distance too far for electrical instruments to detect its cause. Be this as it may, observations with a psychrometer, and appropriate atmospheric electrical instruments, are very desirable to have along with Schonbein's test, and may some day supersede it.

There has been fault found with Schonbein's test, but it is the best that I have experimented with, and is in general use by most ozone observers; it admits of a delicate division of the scale for recording, gives distinct shades for comparison, and when lithographed and each shade numbered, the observer cannot make a mistake, and uniformity is secured.

The Michigan State Board of Health has had the scale lithographed, and to them are we indebted for a gratuitous supply. The method of preparing the iodized test slips requires a word; a dark closet or room with several strings stretched across it, upon which are laid the prepared sheets of cloth or paper to dry, does the best in our climate; paper, during a high wind, will twist off and be lost, old muslin will not; and muslin gives more even reactions, because the air can more freely permeate its meshes than paper admits of; the dissolving of the reagent in the water before adding the starch, insures a uniform mixture, with of course more evenly distributed discoloration when the slips are exposed.

I earnestly recommend that our Board furnish to, say six gentlemen, at various stations from the snowy range to the plains, a complete set of meteorological instruments, in order that such observations be taken simultaneously with ozone; for, in my opinion, ozone observations lose much of their value, unless meteorological observations accompany them. A number of gentlemen have signified their willingness to act as observers for our Board gratuitously, if such instruments are furnished; and, as it is, we are promised ozone observations from Cheyenne, Greeley, Estes Park, Boulder, Denver, Georgetown, Colorado Springs, Pike's Peak, South Pueblo, Cañon City, Alma, and Hermosa; out of these different places we ought to have records that will be of value. Cheyenne, Denver, Colorado Springs, Pike's Peak and South Pueblo, each have a complete set of meteorological instruments, which will enhance the value of their ozone records; the other observers should be supplied.

If, with a thorough system of ozone observation, it were possible to receive from one or more medical gentlemen in each section of our state, weekly or monthly reports of the number of cases with their diseases which they have treated, the question of the prevalence of certain classes of disease, with a maximum of ozone, might be studied.

I think the following terms, used by the United States signal office in Denver, are convenient to express the amount of ozone in the atmosphere.

Number of scale, 0 or no trace.
Number of scale, 1 or a trace.
Number of scale, 2 or light.
Number of scale, 3 & 4 or fair.
Number of scale, 5 & 6 or moderate.
Number of scale, 7 or abundant.
Number of scale, 8 or very abundant.
Number of scale, 9 or excess.
Number of scale, 10 or large excess.

METEOROLOGICAL TABLE FOR THE TOWN OF SOUTH PUEBLO, COLORADO,

FOR THE YEAR 1877.

LATITUDE 38° 15′, LONGITUDE 104° 36′. ELEVATION, 4,753 FEET ABOVE SEA LEVEL. THE BAROMETER CORRECTED FOR INSTRUMENTAL ERROR AND TEMPERATURE ONLY. TO CORRECT FOR ELEVATION ADD 4.72 INCHES WHICH WILL REDUCE TO SEA LEVEL.

OBSERVATIONS TAKEN BY E. S. NETTLETON, ESQ.

	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Mean annual or total.
Monthly mean barometer	25.215	25.312	25.104	25.139	25.079	25.212	25.277	25.288	25.232	25.269	25.255	25.244	25.219
Highest barometer	25.636	25.587	25.358	25.424	25.595	25.474	25.505	25.560	25.518	25.534	25.554	25.639	25 515
Lowest barometer	24.581	25.015	24.712	25.139	24.663	24.877	24.999	25.065	25.019	24 901	24.838	24.879	24.906
Monthly range of barometer	1.055	.572	.746	.285	.635	.617	.506	.505	.499	.633	.716	.760	.609
Mean daily temperature, 7 a. m., F	20.42°	29.39°	37.09°	43.43°	57.71°	65.36°	71.00°	68.09°	57.56°	45.45°	29.90°	20.13°	45.43°
Mean daily temperature, 2 p. m., F	41.61	49.21	59.41	55.40	70.48	78.03	85.68	86.13	76.10	59.07	43.23	48.10	62.70
Mean daily temperature, 9 p. m., F	28.00	34.53	42.71	44.07	58.23	67.27	73.35	72.87	62.23	44.00	33.90	28.62	49.15
Greatest daily range of temperature, F	57	45	49	40	44	35	46	38	48	52	55	56	47.08
Least daily range of temperature, F	10	9	14	9	9	11	13	17	11	7	11	12	11.08
Mean daily range of temperature, F	29.84	29.33	34.43	24.96	27.97	29.90	25.19	24.39	33.13	29.12	32.00	41.74	28.85
Mean of maximum temperature, F	44.35	52.44	63.16	59.13	74.78	82.73	88.29	88 78	81.03	63.78	54.03	51.48	66.16
Mean of minimum temperature, F	14.51	23.11	28.71	34.17	46.81	52.83	62.90	64.39	47.90	34.66	22.03	15.74	37.31
Highest temperature during month, F	62	66	80	78	86	92	98	96	92	85	71	67	81.08
Lowest temperature during month, F	−9	9	8	32	31	41	51	55	37	25	−6	−3	22.58
Monthly range of temperature, F	71	57	72	46	55	51	47	41	55	60	77	70	58.50

Mean of temperature for entire month, F	30.00°	37.70°	46.41°	47.63°	61.14°	70.22°	76.67°	75.70°	65.30°	49.50°	35.64°	32.28°	53.57°
Mean monthly humidity (per cent. of saturation)	....	....	....	....	....	....	....	....	....	....	....	....	....
Prevailing direction of wind	N. W.	N. W.	N. W.	East.	S. E.	East.	N. W.	S. E.	N. W.	East.	N. E.	North.	N. W.
Velocity of wind for month in miles	....	....	....	....	....	....	....	....	....	....	....	....	....
Maximum velocity of wind — Miles	....	....	....	....	....	....	....	....	....	....	....	....	....
Maximum velocity of wind — Direction	....	....	....	....	....	....	....	....	....	....	....	....	....
Clear days in each month	16	15	18	16	14	20	23	25	25	19	14	21	226
Fair days in each month	11	6	10	8	12	9	7	6	2	6	12	10	99
Cloudy days in each month	4	7	3	6	5	1	1	0	3	6	4	....	40
Number of days on which rain or snow fell	1	2	1	6	5	2	6	5	3	2	....	1	34
Amount of rain or melted snow, in inches	0.20	0.10	0.13	3.29	2.09	2.32	2.39	0.75	2.34	0.63	0.00	0.11	14.35
Mean of ozone (scale 1 to 10)	....	....	....	....	....	....	....	....	....	....	....	....	....

SECRETARY'S REPORT.

To the President and Members of the Colorado State Board of Health:

GENTLEMEN: In preparing the second annual report of the Board, the best has been done with the material available, hoping that by showing a disposition to work up such as has been given us, more will be placed at our disposal in the future.

The *personnel* of the Board has, since the previous report, undergone change, as follows: Those members whose commissions expired, viz:

Dr. F. J. Bancroft, of Denver, and Dr. A. V. Small, of Trinidad, have both been reappointed, and in addition, new members have been appointed, as follows:

Dr. Charles Ambrook, of Boulder, *vice* Dr. T. M. Smith, of Fort Collins; Dr. D. H. Dougan, of Alma, *vice* Dr. R. J. Collins, of Georgetown; with one vacancy existing, *vice* Dr. T. N. Metcalf, of Del Norte, removed from the state.

Among the numerous subjects that demand the attention of all in our efforts to improve the public health, that of

VITAL STATISTICS

is of prime importance, as by them alone can we mark the progress in the hygiene of the state. Unaided memory fails to tell us whether a disease is progressing towards extinction, or becoming, as consumption is, one of the greatest evils against which we have to guard.

Vital statistics alone can tell us which of the various states of the Union is the healthiest; which is the least afflicted with the different scourges of the human race; and when told, rest assured, the tide of emigration and consequently wealth flows in that direction. Situated as Colorado is, with so vast a field for individual and public enterprise, with every element for building up a powerful and wealthy community, self interest, if no other motive is appealed to, would dictate that we make persistent efforts to collect our vital statistics.

With six counties, each of which is larger than Rhode Island, eight larger than Delaware, four larger than Connecticut, two larger than New Jersey, and one larger than Vermont, not to speak of the other nine counties whose combined area is larger than Connecticut, we ought to leave no stone unturned to induce people to emigrate where we know immunity from sickness can be found to greater extent than in any other state of the Union.

But *our* knowing it is not sufficient; *we* must prove it to that profession whose province it is to deal with these facts; and when we try to do that, assertions are of no avail. Carefully collected statistics are all that will, or ought to be considered. With every climate within our border that can be found from Washington to Montreal, with the lowest part of our state seven-tenths of a mile above the ocean's level, it is evident that we have a field to collect vital statistics in, such as is seldom found elsewhere. Statistics of one race lose their absolute value if applied to another race, they then are of value only for purposes of race comparison, and as we ought to collect our statistics from the race to be benefitted, there is no other country so favorably situated for these purposes as Colorado, it being inhabited principally by the Anglo-Saxon race. We can here compare this and other European races under similar circumstances as affected by altitude and, of course, climate; observe how disease is influenced by altitude, as well as by the ordinary meteorological conditions.

Very nearly all the vital statistics of the world are based upon observations made in countries at nearly sea level, or at least at an elevation under twelve hundred feet, hence our state as a whole opens up an entirely new field, no part of it being lower than three thousand five hundred feet, and the principal settled portions of it averaging six thousand feet. Fully one hundred thousand people of the Anglo-Saxon race live in a section averaging this altitude. If it proves, as is confidently anticipated, that altitude and dry air are *the* remedies for consumption, and that these conditions induce no deleterious results, then consumption alone will compel the future man to seek a higher altitude, and countries like Colorado will be in time the centers of population. Whether or no such *is* to be the case can only be shown by a carefully collected mass of vital statistics properly compiled, and honest deductions drawn therefrom.

Colorado has a duty. It is estimated that the people coming here for health, bring with them more money than is taken from our mines; if so, let us cultivate that branch of science which will bring more invalids here. Said a very learned medical man to me: "What will be the result of congregating together in one section so many persons with chest troubles; what kind of a race will spring up?" I answered that our rarefied air would expand the chest, and these troubles would not be seen in our children. Said he: "Let your vital statistics prove it." But in addition to recording birth and death rates we ought to be able to do more. We must show what diseases prevail under certain conditions of altitude, as well as their mortality; in other words, show the sickness independent of the deaths. Then foreign physicians will know to what part of the state to direct their patients whom they send here, and something more than caprice, or a vague "go to Colorado" will prevail. As is the nature of things, imitations spring up and fashions change; already are health officers and their reports to be found, claiming as much immunity from chest troubles for their sections, as can be obtained in Colorado, and they base their assertions upon the United States census tables. "Such and such a proportion die in Colorado, such and such die here, consequently our section is as healthy as Colorado;" and straightway they search for the cause of such desirable results, forgetting that they send their incurables to die in Colorado, and the United States census takes no cognizance of *where the disease originated*. We must protect ourselves by a thorough enforcement of our system of vital statistics. Our blanks have a column for "where and when the disease originated," but we must go further and have reports of diseases independent of the deaths, by a system of weekly, or at least monthly, reports of sickness in each city, town, village, and mining camp in our state. Other states are introducing this system, and we ought therefore to do so at once. By such reports we would be made aware of the approach of an epidemic, and the State Board, in the event of the Local Board failing to do its duty, could take measures to prevent its spread, give information to the inhabitants how to protect themselves, etc., and in that way a repetition of the criminal waste of life that occurred among the Mexican population of the southern part of our state by the recent epidemic of small pox, be prevented. But it takes funds to print blanks, pay postage, purchase stationery, and obtain the necessary clerical assistance for compiling these reports, and to remunerate those making them. The Board has prepared a blank for reporting diseases and injuries during each month, and in order to save time to those making the reports a very full list of diseases has been printed. How successful the effort will be, time alone can tell.

It is found that a great many medical men are under the impression that it will be of no use for them to report, because "no one else will, and their report alone will be of no avail." It is self evident that, to starve to death any system of reports, all that is necessary is, for all persons to avail themselves of this argument. On the other hand, to insure success, all that is necessary is that one or more, in each town or section, make these reports; for if any competent physician will report the number of cases of each disease occurring in his practice in a given time, a very fair inference can be drawn of the types of disease with which the community is afflicted. If *each* physician was required to do so by law, we could at once *know* the amount of sickness, and its proportion to the deaths, and knowing the altitude, we could soon construct a map based upon disease and classes of disease as relating to altitude, that would show our medical geography accurately. Such a map would be a valuable addition to our health reports, especially to foreign physicians; and, without doubt, in the light of such information, life insurance tables for Colorado risks could be remodeled to the advantage of those insuring.

As is well known, we have a public health law which, among other things, provides that physicians, surgeons and midwives report all births and deaths occurring in their practice, on or before the last day of each quarter of the year, and that this report be filed with the county clerks; also, these clerks are required to report them at the end of each year to the State Board of Health, which is authorized and required to study these statistics; but our law nowhere provides for the publication of a vital statistic report, such as other states publish, unless the Board embodies it in its annual report as a State Board of Health, which in a few years will be inexpedient; first, because five hundred dollars a year is not any more than enough for the contingent expenses of a Board that is in earnest, much less to pay the secretary for his clerical labor, for office room and for the postage used in correspondence, distributing the reports to our own physicians, foreign societies, boards, etc.; second, the work of a State Board of Health is separate from that of collecting and compiling vital statistics, and to embody the results of both in one volume makes it too bulky and is really of no use to the majority of our people, who ought to have for reference copies of the sanitary portion of our report.

A State Board should have two objects in view, one to collect scientific data, the other to present deductions drawn from this data in a popular form, so that the average citizen would be able to understand and profit by it. In other words, to help educate the mass of our people to protect themselves from disease and death, as well as to present scientific information to men of science. A young Board like our own in a new community, can at present only partially lay the foundation and commence the collection of data from which scientific deductions can be drawn in future years; but to the mass of our citizens, by reprints from our reports, or by the distribution of the report itself, we can present in a popular form the present status of public medicine and hygiene, and by reaching the people at their own firesides, educate them up to an appreciation of what a Board of Health can and will do for the public good. That accomplished, the people's representatives will appropriate enough to carry on the work, especially when it is generally understood that not a member of the Colorado State Board of Health receives a cent for his work, nor for his expenses in attending its sessions; and that to come from extreme portions of the state, hundreds of miles, and neglect private affairs to join in an effort for the public good, deserves from the public a reasonable support in co-operation and funds.

It is hoped that our state will not fail to allow the actual traveling expenses—not pay for time, or work—to each member who attends its authorized sessions, as it does to all the rest of its State Boards, and that the reports be printed and distributed like all other state documents.

As our public health law took effect during the second quarter of 1877, it is not to be expected that our statistics are of much value for this year. County commissioners, clerks and the medical profession generally outside of Denver, were not used to it, nor at once able to fall into line in the matter of reports, hence, with the exception of Denver City, which has had for several years a system of birth and death reports,—a credit to those introducing it,—and the counties of Boulder and Bent, which have reported their births and deaths complete, all other counties are very deficient in the annual reports required by law. Most of the county clerks, however, express a willingness to assist. Some counties inquire how the medical and clerical professions can be compelled, if necessary, to make their reports. The question having been officially referred to the attorney-general of the state, the correspondence is inserted here for the information of all concerned.

OFFICE STATE BOARD OF HEALTH, March 12, 1878.

Attorney-General A. J. Sampson:

DEAR SIR: I have the honor to request your official opinion upon the various laws relating to the State Board of Health and the public health law.

First—Is the law mandatory as to each board of county commissioners organizing as a Board of Health? Is it as regards the mayor and aldermen of each city? Is it as to the president and council of each incorporated town in the state?

Second—When organized are they required by law to appoint a health officer and authorized to incur the necessary expense to provide blanks, etc., for reports and compensate the health officer for his services in making reports called for by the State Board of Health?

Third—Are county clerks entitled to a reasonable compensation for their services in keeping records and making such reports as are called for under the provisions of chapters 8, 63 and 82?

Also, please suggest some feasible and easily executed method of enforcing the penalties the law provides where professional or other persons neglect or refuse to make the reports required by law to the clerks of the several Boards of Health; as such officers have complained that after the blanks are distributed that is the last heard of them, and they dislike to incur the odium of making complaints against delinquents or the liability of having their motives misunderstood.

Very respectfully, your obedient servant,

CHARLES AMBROOK, M. D.
Secretary.

STATE OF COLORADO, ATTORNEY-GENERAL'S OFFICE,
DENVER, April 22, 1878.

Dr. CHARLES AMBROOK, *Secretary State Board of Health:*

DEAR SIR: Yours of inquiry before me.

I. (*a.*) The law makes the board of county commissioners *ex-officio* a Board of Health, and in this sense *organizes* such Board; and it is as necessary for them to discharge this duty as any other. (*b.*) The law is the same as to the officers of incorporated cities and towns.

II. It is obligatory upon these Boards of Health, so created by law, to perform certain duties. They can either discharge these themselves entire, or appoint a health officer (2083) who shall help them in the discharge of these duties—"to examine into all nuisances, sources of filth," &c., (2086.) The law gives the authority and I think all these Boards should appoint a "health officer."

III. (*a.*) The law makes no provision for a clerk to the Board of Health in cities and towns. They must keep their own records, or devise a way to have them kept. If they secure no clerk for the purposes of all official correspondence, the Board itself is its clerk, and communications ordered sent to the clerk if sent to the Board of Health comply with the law. (*b.*) The county clerk is made a member of the Board of Health of counties (2118) as well as clerk of the Board (2082), hence cannot be allowed extra compensation.

IV. It is the *sworn duty* of the members of the Board of Health to require professional and other men to comply with the law in furnishing all reports called for by law, and on their failure to do so, to see that the law is enforced against them. The law is imperative and will not shield them from duty for "fear their motives might be misconstrued."

If there are any who willfully and deliberately disregard the laws, in refusing to report, an "example" of one or two of them will bring the others to a sense of duty to obey the law of the land.

I am, yours, &c.,

A. J. SAMPSON, *Attorney-General.*

The plan of a State Board of Health is to have a central board composed of representative men—not necessarily all of them medical—that will advise and direct the Local Boards in all their work.

The maintaining of public health embraces something from every *department of human* knowledge, and food, climate, dress, disease, habitation, habits, education, and vices of the people must all be considered. Local Boards of Health supply in the main the materials with which the State Board works. In every Local Board, to insure activity and valuable work, one man must in the main be responsible, as it is worse than useless to expect that the entire board of commissioners or aldermen will be on the lookout to detect violation of the local health ordinances. The majority of public officers are politicians whose time and interests are directed to the making of friends and votes; and as the exposure of dirt and filth, suppression of nuisances and prevention of disease can only be accomplished by work and expense, and as they cause trouble by arousing the animosity of those whose neglect, carelessness, or faults cause these conditions, (a filthy man is usually malicious), and as the urging of delinquents in the making of their reports, is unpleasant business, it follows that such work should be paid for, and entrusted as much as possible to one person, in order that excuses and delays may not arise from a divided responsibility. The law wisely contemplates and provides that this work, in the main professional, be done by a medical man, known as the health officer, to be appointed by the Board of Health. On this officer really depends the success, or failure of the plan. He ought to be the executive officer and *ex-officio* a member of the Board. All reports should be made to him, and all reports made by the Board to the State Board should be by him, or in his name. In this way he becomes the authorized channel of communication from his Board to the town or section of country of which he is health officer, and also to other Boards, and, having control of marriage, birth and death reports, he knows whether or no they are correct, and can remedy defects, erase duplicate names, and notify delinquents of missing reports. In this way uniformity is secured, a corps of trained officers is at hand, statistics are of value, and epidemics prevented, or suppressed.

SOCIAL EVIL.

At a meeting of the American Medical Association, Prof. Samuel D. Gross, of Philadelphia, whose age and great experience enables him to speak authoritatively, says: "It would be a matter of deep interest, and, in a practical point of view, of the greatest possible value, if we could ascertain even approximately the extent of syphilis in our cities and larger towns; but for such a decision there are unfortunately no data; it may, however, be assumed that it is of gigantic proportions; that it exists in many of the best and noblest families of the land; that since the establishment of railway travel it has penetrated every rural district; and that it is poisoning and slowly but surely undermining the very fountains of life in every direction, sowing the seeds of death among our people, and gradually deteriorating the national health.

It is no slander to assert that many of the cases of the disease brought under the notice of the practitioner occur in the higher walks of life, among married as well as among single men. Out of a population of forty millions, the present number of inhabitants in this country, it is safe to assert that nearly two millions are at this moment infected with the syphilitic virus. * * * Like apples which rot upon the tree before they are ripe, the children of these infected persons drop dead from their mother's womb, or if they are born alive, they are sure to perish soon after birth. What is called scrofula, struma or tuberculosis is, I have long been satisfied from careful observation of the sick, and a profound study of the literature of the subject, in a great majority of cases, if not invariably, merely syphilis in its more remote types."

We find other eminent physicians who consider scrofula and consumption as sequence of the syphilitic poison, and without going into that question it is certain that a system enfeebled and debilitated by this poison, is in no condition to withstand the assaults of either scrofula or consumption. This being conceded, we ought to have some method of stopping its ravages, as we do other diseases "dangerous to the public health."

Can we not ordain a happy mean between legalizing vice, and letting its consequences go unchecked, by enabling any person who has contracted disease from a public woman, to quietly make a complaint to the health officer who could issue a summons in the name of the Local Board of Health, investigate the truth of the charge, order the woman under treatment, either in a public hospital, or, if she wished and could pay for it, from her own physician, and prohibit her from plying her vocation till cured. With this plan enforced, our towns would not be centers of infection, nor of vice legalized, and yet we have a method of checking and perhaps totally suppressing this malady, as we do any other disease dangerous to the public health. This might at first view seem harsh and summary, but we take fully as summary a method with diseases that only affect the present generation, yet here is a disease that is sapping the vitals of our nation to the third generation, and, ostrich-like, we, by refusing to see the *danger*, vainly imagine that there is none.

MORTALITY.

For the purpose of enabling physicians outside of our state to form some kind of an idea how diseases run in our largest city as well as in the country, so that they can compare the prevailing diseases with those in their own vicinity, I give herewith a brief statement of the mortality of the city of Denver for the year 1877, and that of the county and town of Boulder combined, for the same time, and in all probability these statistics are as accurate as such ever are:

Mortality of the city of Denver, Colorado, for the year 1877. Population, 26,000.

CLASS I.—ZYMOTIC.

ORDER 1.—MIASMATIC.

Cholera infantum	5
Croup	5
Diphtheria	20
Fever, cerebro-spinal	2
Fever, intermittent	1
Fever, scarlet	13
Fever, typhoid	5
Measles	3
Pyæmia	2
Variola	2
Whooping cough	3

ORDER 2.—ENTHETIC.

Syphilis, congenital	1

ORDER 3.

Alcoholism	Intemperance	1
	Mania a potu	2
Abisinthenism		1

Total class one (zymotic)	66

CLASS II.—CONSTITUTIONAL.

ORDER 1.—DIATHETIC.

Cancer, stomach	2
Cancer, uterus	1
Marasmus	3
Rheumatism, acute	1

ORDER 2.—TUBERCULAR.

Phthisis pulmonalis	63
Tabes mesenterica	1
Tubercular meningitis	4

Total class two (constitutional)	75

CLASS III.—LOCAL.

Order 1.—Nervous.

Apoplexy, cerebral	1
Congestion, brain	4
Convulsions, infantile	6
Meningitis, cerebral	1
Meningitis	1
Paraplegia	1
Compression, brain	1

Order 2.—Circulatory.

Angina pectoris	1
Aneurism aorta	1
Abscess, heart	1
Endocarditis from rheumatism	1
Fatty degeneration of heart	1
Hypertrophy, heart	2
Pericarditis	1
Valvular disease, heart	2
Heart disease	4
Paralysis, heart	2
Dropsy	2

Order 3.—Respiratory.

Congestion, lungs	4
Pleuritis	1
Pneumonia, catarrhal	2
Pneumonia, croupous	10

Order 4.—Digestive.

Enteritis	4
Gastric hemorrhage	1
Hepatitis	1
Hypertrophy spleen	1
Obstruction bowels	1

Order 5.—Urinary.

Diabetes mellitis	1
Bright's disease	4
Nephritis	1

Order 7.—Locomotory osseous.

Coxarum morbus	1
Total class three (local)	64

CLASS IV.—DEVELOPMENTAL.

ORDER 1.—CHILDREN.

Atelectasis pulmonum	2
Difficult dentition	1
Cyanosis	1
Debility congenital	5
Icterus neonatorum	1
Premature birth	2
Congenital defect	1
Still born	6

ORDER 2.—WOMEN.

Exhaustion from tedious labor	1
Puerperal fever	2
Puerperal peritonitis	1
Puerperal septicæmia	2

ORDER 3.—OLD AGE.

Senile debility and its results	11
Total class four (developmental)	36

CLASS V.—VIOLENCE.

ORDER 1.—INJURIES.

Burned	1
Frozen	1
Wound, gun shot	1
Lightning	1
Railroad injury	1

ORDER 3.—SUICIDE.

Suicide	6

ORDER 4.

Cause not ascertained	3
Total class five (violence)	14
Total of all deaths	255
Births reported for same time, but very deficient because the same checks *cannot* be enforced	373

Twelve principal causes of death in Denver, Colorado, during year 1877, *in their order of frequency.*

		Per cent.
Consumption	63	24.7
Diphtheria	20	7.8
Scarlet fever	14	5.4
Pneumonia	14	5.4
Diseases heart	13	5.0
Diarrhœal diseases (five years and under, 8; over five years, 2)	10	3.9
Typhoid fever	6	2.3
Diseases kidney	6	2.3
Infantile convulsions	6	2.3
Puerperal diseases	5	1.9
Croup	5	1.9
Congestion of lungs	4	1.5
All other diseases, including seven cases of old age between 70 and 97 years of age	89	34.9

Months in order of greatest mortality (each being equalized to 30.44 days) are December, April, March, July, January, February, June, May, September, November, August, and October.

The seasons in order of greatest mortality are—

Winter, per cent. of all deaths	31
Spring, per cent. of all deaths	28
Summer, per cent. of all deaths	23
Fall, per cent. of all deaths	18

(In the deaths from consumption, a large percentage of the cases were contracted outside of the state.)

Mortality of Boulder, town and county combined, for the last three-quarters of the year 1877. *Estimated population,* 10,000.

CLASS I.—ZYMOTIC.

ORDER 1.—MIASMATIC.

Cholera infantum	4
Croup, membranous	2
Fever, congestive	2
Fever, scarlet	18
Fever, typhoid	1
Total class I	27

CLASS II.—CONSTITUTIONAL.

ORDER 2.—TUBERCULAR.

Phthisis pulmonalis	4

CLASS III.—LOCAL.

ORDER 1.—NERVOUS.

Apoplexy, cerebral	3
Meningitis	2

ORDER 2.—CIRCULATORY.

Pericarditis	1
Valvular disease of heart	1

ORDER 3.—RESPIRATORY.

Pneumonia, catarrhal	1
Pneumonia, croupous	4

ORDER 4.—DIGESTIVE.

Enteritis	1

ORDER 6.—GENERATIVE.

Cellulitis pelvic	1
Ovarian tumor	1
Total class III	15

CLASS IV.—DEVELOPMENTAL.

ORDER 2.—WOMEN.

Puerperal fever	1

ORDER 3.—OLD AGE.

Old age	1
Total class IV	2

CLASS V.—VIOLENCE.

ORDER 1.—INJURIES.

Ruptured ilium	1
Contusion	1
Poison	1

ORDER 2.—HOMICIDE.

Gun-shot wound	1
Total class V	4
Total of all deaths	52
Add deficiency of 20 per cent. owing to some physicians failing to make up their reports for the entire year	10
Total	62

It will be seen that diseases incident to hot weather are comparatively light in Colorado.

The state is not exempt from the usual epidemics of the northern and western states, but they run a much lighter course among our white population where the faintest form of sanitary measures are observed, and the small pox epidemic of 1877, among the Mexican portion of our population, was no exception to this rule.

SMALL POX EPIDEMIC.

In the absence of a report from the committee on epidemics and contagious diseases, the secretary made an effort to obtain the statistics of the small pox epidemic, that swept over the southern portion of our state during the past year. The several county authorities were requested to furnish reports, as required by law, but from some counties no answers have been received to the communications sent; others could give no information owing to lack of data. Recourse was then had to the bishop in charge of the Catholic church in this state, who cordially co-operated, instructing the clergy to assist the Board; in consequence of which, blanks with questions were addressed to each of the pastors in charge of congregations in the small pox district. It is to be regretted that replies have been received from but two; these, however, contain the greater portion of the information received.

The medical profession in these parts appears to be unable to furnish reliable information on this subject, owing to the disease having principally afflicted the Mexican population, and the extracts from the reports show how they view medical assistance. On the other hand, the results of medical and intelligent sanitary efforts are markedly shown, by the fact that the same disease appeared in the city of Denver, in January, 1877; its population is 26,000, yet its official reports (and they have a good system of birth and death reports), show but two deaths from it, one in January and one in April. Contrast this result with the same disease in Las Animas and Huerfano counties, aggregating a population of 13,400, where we find 4,200 cases with a mortality of 720; surely here is a field for Local Boards of Health in Colorado.

Rev. Charles M. Pinto, of Trinidad, pastor of the Catholic congregation of Las Animas county, (population 9,200, area 9,072 square *miles) writes:* "*First* heard of small pox in June, 1877; supposed *to have been* brought from New Mexico. For nearly three months the disease was confined to a zone of five or six miles around the town of Trinidad, then it spread all over the county of Las Animas and neighboring settlements, dying out toward the end of December.

At least one thousand were attacked, with a mortality of over four hundred; I visited at least three hundred, and my two assistant priests might have exceeded that number. It seems a well established fact, that no person was taken sick, without contact with those that were infected. Cleanliness, proper care, vaccination, etc., could have saved to say the least, two-thirds of the lives, but the gross ignorance and carelessness shown, could not but multiply the number of victims; and besides the contact, there must have been a predisposition to the disease; in fact, Indians were invariably attacked with the black small pox, and they generally succumbed; there is scarcely one of them left in the Mexican families. The majority of the population are Mexicans, and consequently it is not astonishing that they lost more than others; the ages of the victims ranged from four to thirteen years; very few adults. The number of Americans that died is comparatively small."

The Rev. Gabriel Ussel, at Walsenburg, pastor of the Catholic congregation of Huerfano county, (population 4,200, area, 1,584 square miles), writes: "Small pox epidemic occurred during months of October, November and December, 1877; and January, 1878. Total number of deaths, about three hundred and twenty; of this number, there were twenty over sixteen years of age, four or five of this twenty being foreigners, leaving about three hundred under sixteen years of age. It has been about fifteen or sixteen years since the last epidemic of small pox visited this section. According to my observation here and in other Mexican settlements, the ratio of death was a literal decimation. If I remember correctly, and I noted it at the time, the ratio of deaths in 1861 and 1862, was but a little over one per cent."

Dr. T. A. Barker, notes in his official report as coroner of Huerfano county, three adult Americans, dying from small pox, and three hundred and twenty Mexicans, of all ages and sexes, and says: "The great excess of deaths among the Mexican population is owing principally to habits of life, management, superstition, and want of proper medical treatment."

Charles O. Unfug, clerk and recorder of Huerfano county, writes: "Population, two-thirds Mexican; small pox prevailed during months of September, October, November, and December, 1877, mostly *among the Mexicans*; estimated deaths, from three to four hundred, mostly children; I know of but one Mexican case where a doctor was called."

Coroner Wm. H. Chavill, of Costilla county, (population, 2,000), after stating his inability to make reports, because: "No statistics have been kept of births and deaths in this county," goes on to state that "a good many children have died here with the small pox, between September, 1877, and January, 1878; but I cannot tell how many."

C. F. Meyer, clerk and recorder of this county (Costilla), writes: "County commissioners have failed to organize as a Board of Health. * * * We have but one physician in the county; Mexicans constitute three-fourths of the population. * * * Physicians are seldom called in cases of birth, or even sickness and death * * *" and in a later communication he says: "Estimated number of deaths from small pox epidemic of 1877 is, Mexicans one hundred and twenty, and four Americans."

Clerk and recorder, O. D. Downtain, of Hinsdale county, reports: "One case, no death."

C. W. Baldwin, clerk and recorder of Saguache county, reports: "Six cases among Americans in town of Saguache, one of them fatal, and about twenty-five cases among the Mexicans, eight or ten of them fatal;" and goes on to state, "by means of vaccination and disinfection and rigidly quarantining the infected portion of the Mexican population, we were soon rid of the disease."

F. C. Sherwin, clerk and recorder of Rio Grande county, (population, 3,600), reports: "Small pox reached us, January 4, 1877, (probably 1878), and continued until about April 1, 1878. Estimated number of cases, Americans fourteen, deaths four; Mexicans fifteen or sixteen, deaths five or six. The authorities had a pest house and nurses, to which a number of the cases were taken and treated. We have no data upon which to base a true and correct report."

In the report of the coroner of Bent county, Dr. G. W. Phillips, we find that three Mexican children died of small pox.

Clerk and recorder, John Wilson, of Fremont county, reports: "One case of small pox, an American, no death."

The deputy county clerk and recorder of La Plata county, reports: "There were two cases, both Americans, no death."

The above is all the information that a very extensive correspondence has elicited, but the fact is clearly shown, that the small pox visited in a severe form, the counties of Las Animas, Huerfano, and Costilla, with a fatality of one death to every twenty-three of inhabitants in Las Animas county; one death to every ten inhabitants of Huerfano county; and one to every sixteen of its inhabitants in Costilla county; footing up eight hundred and forty-four deaths in the three counties.

Conejos county lying immediately west of Costilla county, and on the north line of the territory of New Mexico, from whence the disease was imported, fails to report on this epidemic, but we have no reasons for supposing that the disease visited its inhabitants, who are mostly Mexicans, in any milder form than it did the three counties previously mentioned; which if not, would increase the mortality, (basing it upon the mean of the three counties mentioned, being one death for every sixteen of its inhabitants), to nine hundred and eighty, for the counties of Las Animas, Huerfano, Costilla and Conejos, excluding the deaths mentioned in the counties of Saguache and Rio Grande, in all thirteen more. In regard to the number of cases from which this mortality occurred, it is difficult to form an idea, Father Pinto, of Las Animas county, being the only one who gives estimates. His are, that there were two and one-half cases to each death; on that basis, nine hundred and eighty deaths would have two thousand four hundred and fifty cases, in the four counties mentioned, which in the aggregate had a population of eighteen thousand; although the statistics are crude, yet the major part of them emanate from the Catholic clergy of that section, and when we recollect that it is their duty to visit, if possible, every one sick and dying, and, that among that class of our citizens, no effort is spared to obtain the services of their religious teachers at such times, I cannot but think them about as reliable as statistics of epidemics ever are; but we may severely discount these figures, and then the fact remains, that there has been a great waste of human life, by a disease absolutely preventable, and which, if it does unaccountably appear in a community, can be suppressed if the local authorities will do as was done in Saguache, Del Norte, Denver and other places.

In an account of this same epidemic in the territory of New Mexico, published in the Denver *Tribune* in the spring of 1878, the number of deaths was given at six thousand. Now suppose that on its appearance there, the proper preventive measures had been adopted by the local authorities of that section of our state in proximity to it, and its importation into Colorado prevented, or its spread checked if it did appear among us, what a saving of life could have been made? And all that was necessary, was to have ENFORCED OUR PUBLIC HEALTH LAW.

The following communication from Dr. Jesse Hawes, health officer of Weld county, received after the small pox report was in the hands of the printer, is appended because of its value in showing the efficacy of both vaccination and local sanitary efforts:

CHARLES AMBROOK, M. D., *Secretary State Board of Health:*

SIR: In answer to your questions sent me, concerning cases of small pox occurring in this vicinity, I will reply by answering your questions in their regular order:

First—"Did small pox make its appearance in your county during the year 1877?" Yes.

Second—"If so, at what date did the first case occur?" March 12, 1877.

Third—"How many cases occurred?" One.

Fourth—"How did the first case originate?" Patient was a tramp. Had been in Cheyenne, Wyoming, about two weeks previous to his attack. At that time small pox was prevalent in Cheyenne.

Fifth—"Had patient ever been vaccinated?" No. He stated his parents did not believe in vaccination.

Sixth—"What was the type?" Confluent.

Seventh—"Was he brought into contact with unvaccinated persons?" Yes. The day previous to eruption three or four unvaccinated boys passed several hours in same room with him.

Eighth—"What means, if any, were used to prevent extension of the disease?" All persons, whether previously vaccinated or not, who had come in contact with him, were immediately vaccinated. He had been occupying a deserted house in the town. The room occupied by him was *thoroughly saturated* with the fumes of burning sulphur. All bedding, clothing, &c., not carried with patient to pest-house, was burned. The patient was immediately removed to a house out of town, and nearly a half mile from all neighbors. A vaccinated nurse remained with him until his death. No other person except myself came in contact with him. When visiting him I wore a special suit that was removed immediately after visit and placed in atmosphere of sulphurous acid, and my whole person was sponged with a two per cent. solution of carbolic acid. After death of patient all clothing, bedding, &c., that had been in house with him was burned. The house was *thoroughly* fumigated with sulphur fumes. The nurse burned all of his own clothing, washed himself in a two per cent. solution of carbolic acid and was provided with a new suit throughout, placed near the house and donned where placed.

Ninth—"How many persons contracted small pox from first case?" None.

JESSE HAWES, *M. D.*

INSANITY.

The subject of insanity, demands an early attention from our legislature, and with this view it is here considered in a brief practical manner, leaving its scientific study and investigation for other and abler members of the Board, at some future time. The practice of transporting our insane a long distance out of our state, and at great expense, away from the oversight and control of our state authorities, is of doubtful expediency; to that and the necessity of a state insane asylum, the following is given:

Insanity is a product of civilization. Among savages it is unknown, yet higher education is not the cause, for the higher and intelligently educated furnish relatively but a small per cent. of the insane.

A diseased mind is proof of a diseased body, and conclusive evidence that the principal disturbance is located in the nervous system, usually the brain.

Insanity is undoubtedly on the increase, and will be just as long as we fail to teach a better knowledge of self in our schools and colleges, and do not recognize the symptoms of approaching failure of nerve power. Without here going into the subject of the origin of nerve power, it is safe to say that every action of our body is brought about upon mechanical principles, and is amenable to its laws; over strain of a muscle is easily recognized by fatigue, pain, and refusal of the muscle to perform its work; the same rule holds good as to our brain and nerves; fatigue, inability to fix the attention, defective memory, irresolution, irritability, despondency, incoherence in speech, and persistent sleeplesness, are all indications of an overtasked and failing mind. Pain may, or may not be persistent, but when control of the mind is lost, we say that the person is insane. Did we understand ourselves better, we would in time interpret the symptoms that indicate failure of the mind, and by exerting ourselves less, changing occupation, surroundings, habits, and by checking our vices, the incipient insanity could be stopped. But educating the rising generation to "know themselves," is a work of time, and the insanity is upon us as a people, and of the two questions, how to remove the cause, and how to take care of the insane, the last is of the more pressing importance

The care of the insane has been a difficult question for all civilized nations, but it is now conceded that the state should control it, not that it should necessarily own the asylums or homes for the insane, but an active supervision is an imperative necessity, both to protect the interests of the insane, and those dependent upon them.

Experience and statistics prove that the chances for the cure of insane persons, depend upon the promptness with which they are placed under proper treatment; they also show that the nearer an asylum approaches to the condition of a home, the more effectual is the treatment, and that, while application of restraint is often necessary, it is best to remove the external forms of it as much as possible. If the patient's strength is not impaired, some kind of occupation that does not require much mental activity is necessary, as well as amusement. Solitude confirms insanity; but above all, the chances for recovery are vastly improved by an immediate and complete removal from old surroundings and acquaintances, and it follows that, if this is correct, the old home is the last place in which the insane should be kept and that, not only for their own sakes, but because the safety of their friends and family is at stake. The facts are that an insane person will more patiently submit to restrictions with strangers, than with old acquaintances, not to speak of the more thoroughness with which medical treatment can be carried out with trained assistants, where all obey a system with rules; this can be possible only where it is made a business; it is unattainable in the old home, where the patient has been accustomed to command instead of obeying.

This brings us to the consideration of what is the best method of conducting an asylum? As a rule, to insure the necessary funds, state patronage is required; yet we often find private asylums necessary, to do things that the state, from mistaken ideas of economy, fails to do. Among the most prominent of these may be mentioned, providing ample room to each patient, pleasant grounds, facilities for care and treatment, especially a sufficient number of attendants; too often the surgeon in charge has the entire business management of the affair given to him without a business assistant; this throws the medical treatment from his hands into those of young, inexperienced subordinates, to the detriment of the patients; in fact, the state too often comes to regard the asylum as a mere house of detention, because the safety of the community requires the seclusion from society of the lunatic. Such should not be the prevailing idea; an asylum is a hospital for diseases of the mind, and it is cheaper to cure than to let the patient slide into the condition of a confirmed, and too often violent and dangerous, invalid.

In speaking of the best method of conducting a hospital for the insane, it is doubtful if the community system of Gheel in Belgium will ever be excelled, but that is not available for Colorado; the only thing we could do would be to imitate it; but, again, that system is a growth of six centuries, and it is an impossibility for us to find in this state, an entire community that would be willing to devote itself principally to the care of insane; so we are limited to asylums, public and private, of the kind we are accustomed to, for the care of the afflicted among us. I do not enumerate jails and poor houses, the world has outgrown that method; words are too weak to express the injury done, by placing insane persons in such places, even temporarily. To cage a human being, guilty of no crime, like a wild beast, without exercise, and, as is usual, without sufficient pure air, would make a well person sick; and, when taken out for exercise, if this is ever done, to be stared at, questioned by old acquaintances, kept under restraint by an attendant who, as a rule, is both ignorant and afraid, is enough to make a sound mind crazed, and could not but confirm a disease that, at the time, may be in its first stages. It is by mistaken economy that a patient is thus cared (?) for in a jail, or poor house, and it is often the case that, to avoid the expense of a long journey east, to a too often over crowded asylum, one delay after another is made, as both county and friends are averse to the expense, until the case becomes confirmed, and the burden is fastened upon the county as long as the patient lives; when, in many instances, a prompt removal, after judicial and public inquiry has been made into the sanity of the patient, to a well conducted hospital in our own state, would have soon returned the patient to himself and friends, and relieved the county of a grievous burden.

There are honest differences of opinion as to how public an investigation should be made into the sanity of a person, but after a little experience and considerable thought upon the subject, I believe that the shock to the patient in being questioned and examined in open court, by the court, physicians and jurors, is not so great as it is when he suddenly finds himself an inmate of an asylum, without this public and legal inquiry, and it is no more injurious; certainly, an open judicial investigation is necessary to protect all of us, in these days of charging insanity to prevent persons from marrying, or from disposing of property accumulated by themselves. The old method of one or more medical men in a close room, deciding upon the liberty of any one, is repugnant to the Anglo-Saxon idea of fairness, and yet, as delay of treatment is hurtful to the patient, and endangers the safety of the community, prompt action is necessary.

Under the workings of our present laws, fairness to the patient and safety to the community are secured; and all we now need is an asylum, with proper facilities for treatment, including competent attendants. That it is a real necessity, is shown by the following facts, obtained by sending out circulars to the clerks and recorders of the several counties, who, with but few exceptions, promptly gave the required information :

REPORT
OF
INSANE FOR YEAR 1877, BY COUNTIES.

COUNTIES.	Total insane in county.	Number kept in other States.	Number kept in the county.	Supported by friends.	Supported by the county.	Amount paid by county on account of insane persons during 1877.
Arapahoe	10	6	4	...	10	$3,500
Bent	...	...	...	...	...	......
Boulder	4	3	1	1	3	858
Clear Creek	...	...	...	...	...	......
*Conejos	...	...	...	...	...	......
Costilla	1	1	...	...	1	76
Custar	...	...	...	...	...	......
Douglas	...	...	...	...	...	......
Elbert	...	...	...	...	...	......
El Paso	1	...	1	...	1	160
Fremont	2	2	...	...	2	290
Gilpin	2	1	1	...	2	600
*Grand	...	...	...	...	...	......
Gunnison	...	...	...	...	...	......
Hinsdale	1	...	1	...	1	2,300
Huerfano	...	...	...	...	...	......
Jefferson	2	1	1	2	...	......
Lake	1	1	...	...	1	574
La Plata	...	...	...	...	...	......
Larimer	...	...	...	...	...	......
*Las Animas	...	...	...	...	...	......
Ouray	...	...	...	...	...	......
Park	1	1	...	...	1	400
*Pueblo	...	...	...	...	...	......
Rio Grande	...	...	...	...	...	......
Routt	...	...	...	...	...	......
Saguache	1	1	...	...	1	450
San Juan	...	...	...	...	...	......
Summit	...	...	...	...	...	......
Weld	...	...	...	...	...	......
Total	26	17	9	3	23	$9,208

**No report received.*

Amount paid by state during year 1877, $6,155.

The state auditor reports paying $6,155 on account of claims for insane persons filed before January, 1877, and in addition issuing certificates of indebtedness for same purpose on claims presented since that date.

Here we find twenty-six insane persons as belonging to the state, all but three of them supported by the county. Seventeen of this number are kept at various asylums in the Mississippi valley. The expense of keeping an insane person there is $400 a year, equal to $6,800 a year for the seventeen; average expense of taking each patient there $200. Would it not be better to keep this money in Colorado? The total county expenses for these twenty-three insane persons—three of our insane are reported as being supported by their friends—is reported at $9,208 during the year 1877. Upon perusing this statement, there may be persons who will think that there is, after all, but little need of the state moving in the matter, if twenty-six is the total number of insane in Colorado; but to one informed on this subject, no surprise will be manifested when told that one hundred and twenty-six is a much closer estimate of the true number of insane in Colorado with our population of 146,000. To clear up this point it must be remembered that county clerks cannot as a rule know of the sanity of the inhabitants of their county; for instance, the feeling is yet strong among our people that insanity in a family is a disgrace, instead of being a disease which we are all more or less liable to, so they seek to hide it, and in consequence, but few are aware of it until some violent outbreak on the part of the afflicted person occurs, perhaps a suicide or a homicide, and then the insanity is gladly acknowledged to put a stop to criminal proceedings, but the expense is on the county just the same, only in a different form. Again, to show how little these reports of insanity indicate the real necessity for an asylum, I will quote from the 1871 report of the United States Commissioner of Education:

> In a state where perhaps a hundred patients are known, the government builds a hospital, but, looking providently to the future, plans it large enough to accommodate one hundred and fifty; soon after its doors are opened, the hundred appear, and in a short time the other fifty, and still more apply for admission; the state builds wings for another hundred with the same far-seeing prudence, but in a short time the new rooms are filled; again there is a crowd and a new demand for expansion.

The question arises, where do they come from? Perhaps that can be shown by taking Boulder county for an example, (population, 13,000); in the reports given we find it credited with four insane, yet to my personal knowledge it has three more than it reports. Every one of them has put the authorities to more or less expense, and all of them at any moment are liable to become violent. My personal acquaintance in the county is limited to the vicinity of my residence, but in performing the duties of county physician during the past five years, there have come officially under my notice fourteen cases of insanity; six of them I disposed of after they had been more or less expense to the county, so that they are not now on hand to swell the list and expenses, but each and all found their way to asylums in Eastern states. Of the remainder, five were sent to asylums East, and the remaining three are at large, one of these three at great risk of setting on fire anything that he fancies in need of being purified by his summary method of a match and kindlings; the other two are at home, but require the incessant care of their friends, and are a constant dread to many. One asks, is it possible that other counties are so afflicted? I answer, according to population, yes. The Commissioner of Lunacy for the state of Massachusetts in 1854 requested every physician in the state to report the insane within his knowledge; ail but four reported. After excluding duplicate names and correcting the list, there was found to be one insane to every four hundred and twenty-one inhabitants. The United States census shows one insane to every one thousand inhabitants, and census statistics on that subject are proverbially deficient; but, on the United States census basis, the state of Colorado ought to provide for the accommodation of one hundred and forty-six insane persons.

Humanity and economy both demand that we stop sending our insane to other states, among strangers, and too often where the buildings are already crowded.

THE HYGIENE OF SHADE TREES.

In a country as dry and treeless as is Colorado east of the mountains, in addition to the financial view of tree planting, we have a hygienic one which is a far more important consideration, and one that affects the health and comfort of our families, possibly to a greater extent than many think. This side of the subject can be more tersely shown by taking as an example two families, one living in a house built on an open piece of ground, the other surrounded with shade trees; the first dwelling is searched by every wind in winter, which drives all within doors, the cold blasts increase the consumption of fuel, and the continual breathing of the house air without exercise provokes consumption of the lungs; while, during the summer, the heat and glare of the sun compel the children to remain in doors, to be in the way of the mother in her household duties, to breathe poor air, to fail of proper exercise, to worry the mother and each other, demanding time and care that they could better bestow upon themselves if the proper facilities were provided; spoiling their tempers, and inviting, if not actually creating, sickness that costs more than a forest of trees. The effects of such an uncomfortable home will extend all through life.

In regard to the other house, the few shade trees around it invite and permit the children to be out all the day, cool and good tempered, exercising in every imaginable way, breathing pure air, developing healthy bodies, amusing themselves and giving the mother time to attend to her household duties, with her strength and health improved by escaping extra work and worry. The branches of the trees invite the birds who keep down flies and noxious insects, and echo the children's merriment with their song; and in winter, a brake is provided against the searching winds.

All this to some persons is of no practical importance; they see no dollars nor cents in it; they think the ground pays better, planted with potatoes, not understanding that the world would be surprised if it knew how many cases of summer complaint among children, and sun stroke among adults are prevented by shade trees, on the principle that an ounce of prevention is worth a pound of cure. There is hardly a disease that is not favorably modified by the influence of shade trees around a house, especially in as dry a climate as Colorado, where the dense shade which in low wet countries is often injurious, in our air would be a blessing.

Shade could be as gratefully applied to our walls, porches and windows by planting a few cuttings from any hardy grape vine, wild or tame, that will not die down in winter. The leaves are large and numerous, the shade is renewed each year without any further work, it will hide many a blemish of the house, the vine is ornamental and useful for its fruit, which is more than can be said of the numerous creeping plants which by many are trained with so much care, requiring a month or more before they are either ornamental or useful for shade, and by the time they are grown, begin to die. The grapevine, however, leaves out early, remains late, furnishes a healthy fruit in addition, and, once planted, is on hand each spring without further work.

An effort was made to present in this report, a brief but comprehensive SANITARY SURVEY OF THE STATE, to include so much of its physical geography as would lay the basis of a clear understanding of all future sanitary reports, but lack of time and our limited appropriation prevented the necessary blanks being printed, and without them, the required uniformity of method in such reports could not be observed. As it was, reports were received from but two counties and two public institutions, viz: Boulder and Gunnison, School of Mines and the Deaf Mute Institute, which, with some individual reports, were filed away until a uniform and general system could be devised. Similar reports have been found to work well by other State Boards of Health, and in fact by them alone can the sanitary history of a town or county be preserved, and the value of such a history in future years to trace the cause and progress of disease and classes of diseases, cannot be overestimated.

MEDICAL EDUCATION.

As may be inferred from the tenor of the foregoing subjects, the duties of a practitioner of medicine constitute an important item of the prosperity of a community. He, by virtue of his position, assumes duties and obligations that none but a conscientious and liberally educated person ought to be entrusted with. He cannot, even if he would, avoid the consequent responsibility; and it is his duty to keep records and transmit copies to the proper authorities; to assist the state in all her efforts to promote the public health; to sound the alarm on the approach of epidemics, or dangerous diseases; and, in short, whether he wills it or not, he is in reality a private health officer, and all conscientious medical persons act in that capacity so far as their influence extends. Now, to say that this obligation is a one-sided affair, that the state can exact and enforce obligations without assuming any towards the person. or class obligated, is simply preposterous. Let us then inquire, what are the duties of the state toward the medical profession? Obviously it must do nothing toward degrading the profession; it should protect the individual members by not compelling them to compete with persons notoriously incompetent to discharge the obligations it imposes, and the only way it can do this is to see that every practitioner of medicine and surgery going into a strange community, possesses a fair medical education. Yet this is a subject to be approached with diffidence, for there are many who view any legislation upon the subject, as "class legislation," prejudge the cause, and refuse to listen, forgetting that the most liberal of all works, the Lord's, is protected *and guarded by* an examination as to qualification, before a candidate is invested with the right to preach the gospel. No church recognizes a minister without a license. To teach the lowest grade of a school, an examination and a certificate are required. Before a court will permit its time to be occupied by an advocate, it requires his examination and enrollment on the list of attorneys, and the constitution of Colorado prohibits the qualifying of a legally elected judge, unless he is "learned in the law." Here we find theology, education and the judiciary protected by prerequisite qualifications, and nobody calls that "*class legislation;*" but here is a calling more abstruse than any of them, without a single safeguard, and yet it is one in which the majority of mankind, from a lack of knowledge of the subject, are still less able to protect themselves from imposition.

In Colorado any person can steal the title of Doctor of Medicine, hang out an office sign, and, being among strangers, is likely to be called upon in the most desperate cases, where the best qualified practitioner would find his skill put to a severe test; and, let the result be as it may, he can collect a regular fee for his malpractice, miscalled professional services, burlesquing the term, for how can a person render professional services without professional knowledge? He hides his ignorance by the sophistry, "that patients die while under the care of the best educated physicians," consequently he is as good as the best, and quiets the patient's friends by making a reduction of his bill, as if his services were not dear at any price; and by his plausibility, seeks to make amends for his lack of ability: having invested nothing in his "self-styled" profession, what he makes is clear gain.

All this is radically wrong; life without health is valueless to the individual, and a positive burden to the state at large, which is required to support the invalid; some one must raise the food, build the houses, and furnish clothing for us all, and if we fail to give an equivalent, we are either directly or indirectly a burden to the community; our amiability, social surroundings, or the affection of friends does not change that fact.

If this proposition be true, and the fact that the prolonging the life of one healthy adult ten years, is of more value to the community than the birth of three children, and that the success of morality, education and the judiciary depend upon the healthy body, why, in the name of common sense, do we, by law, require a knowledge of their professions, from ministers, school teachers and lawyers, and yet let the custodians of what is the corner stone of all three, viz.: public *health, go hap hazard*? The answer often is, doctors do not agree among themselves, consequently it is impolitic to legislate upon the subject. To that, we say, when one opinion is reached, progress stops; at that point nothing remains but to divide the spoils; but please to show the profession, or trade, the members of which agree among themselves, on even vital questions? Certainly not one of the three professions cited can be urged as our example, yet to practice their profession we find requirements upon them all, sanctioned by law.

Again, the objection is urged, that the "schools of medicine are diametrically opposed." Granted; no one asks for legislation on schools of medicine, all that is asked for is legislation on such points as all schools and even the laity do agree upon, viz: that a knowledge of the structure of the human system is necessary for the practice of medicine and surgery, hence what we term anatomy is the first requisite; second, a knowledge of the functions of each organ or part in health, which we term physiology, is needed; third, as chemistry enters into every department of human knowledge, from agriculture up, certainly a fair knowledge of it should be required of all physicians; fourth, with a knowledge of the preceding three, a person is qualified to observe the effects of disease on the body, which we term pathology and pathological anatomy; fifth, a knowledge of the principles of surgery, is necessary to all schools; sixth, obstetrics is an important branch of medicine, and does not enter into the discussion of schools, and all should be required to have a knowledge of it.

Now here are six distinct branches, that *underlie* the theory and practice of medicine, and the application of remedies in disease called therapeutics; these six branches are fundamental, and no reasonable person can call it "class legislation" to require a knowledge of them; in fact these branches are taught from the same text books in *all* colleges, irrespective of schools; hence, the state can, as the custodian of the interests of the people, demand that all practitioners of medicine and surgery, or any of its branches or specialties, pass a reasonable examination upon the six topics mentioned, and to those so doing, grant a license, and prohibit those who cannot, from practicing within her limits. No matter what else colleges may claim, they all claim to send out graduates well grounded in these six branches; hence, the state, as it ought to, only proves their work, and does so in the interest of public health. Right here it is germane to state that, with a thorough knowledge of these six branches, the other three, viz: materia medica, therapeutics, and the theory and practice of medicine, *can safely* be left to the judgment of the practitioner; the practice of *medicine is* a matter of judgment, and no sensible practitioner asks legislation upon that subject which would be class legislation, deservedly odious to all; actual practice and results settles theories.

As to the question, "how shall we find out the qualifications of practitioners on these six branches?" we reply, the appointment of a non-sectarian board of six or more reputable practitioners, now permanent residents of our state, is without doubt the simplest and cheapest way, and the least liable to cause a clash of interests; it has been found to work well in other states and countries, and to promote harmony in the entire profession; and besides, has the merit of being liberal. The board, to avoid undue influence and secure fairness, should be appointed and controlled by the state, and the head of the judiciary is undoubtedly the best one to make the appointments.

SUMMARY OF SECRETARY'S REPORT.

In conclusion, I would respectfully call attention to the following points upon which legislation is desirable, either to simplify or improve the workings of our present laws; or else to promote the cause of public medicine, and the efficiency of our State Board of Health:

To provide for a monthly, instead of a quarterly, report of marriages, abortions, miscarriages, births, deaths, interments, and prevailing diseases from all persons solemnizing marriages, physicians, surgeons, midwives, coroners, undertakers and sextons, or cemetery authorities.

The blank form for such reports to be provided by the registrar of vital statistics, or the secretary of the State Board of Health, as the case may be; and also, where there are no abortions, births, premature births, still births, deaths, inquests, burials or interments occurring in the month, the persons shall so state that fact across the face of the report or return, and forward it according to law. Under the workings of our present law when persons neglect or refuse to report, it is impossible to call them to an account, because the authorities are not always sure that a birth, or death, has occurred in their practice; and when three months elapse between reports, the persons may move away, or neglect to furnish the required information until too late, making the report of no value.

Instances have occurred where practitioners declare they cannot recollect whether a death has occurred in their practice during the *past three months* or not. Monthly reports remove all these excuses.

Some states require each marriage, birth and death to be reported separately and immediately, but in a sparsely settled community that may not be necessary.

The parents, (father, if at home,) of a child born, or one dying, where no professional person is called, should be required to report at once, because they may move away or neglect it, and from these two causes, vital statistics are very defective.

The law should require a burial permit from a health officer, before a corpse is interred, or in his absence from the nearest justice of the peace; such permit to be taken up by the persons having control of the cemetery. Also, that the cemetery authorities should keep a record of all burials on the same kind of blanks as physicians report deaths upon, but with extra columns for recording the date of interment, number of burial lot, person who had charge of the corpse, name of undertaker, and such other information as may be prescribed by the registrar of the state vital statistics, or secretary of the State Board of Health, as the case may be. We have so many strangers coming among us, who marry, or die, that we ought to have abundant records to protect the interests of all parties.

The grand jury should inquire whether reports of vital statistics are made promptly and accurately, as the law requires, and present those who do not, as Local Boards of Health and health officers are too often charged with bad motives in prosecuting those who wilfully disobey the law, sympathy is manufactured for the delinquent, and the law defeated.

There should be a state registrar of vital statistics with authority to prepare blanks and instructions, and distribute the same to all persons from whom reports are required, and he should be authorized to receive and take charge of all vital statistic reports, compile the same and report each year to the executive, and the law should explicitly provide for the printing and distribution of the same, along with the other executive documents, as is the custom of other states.

The law should provide funds, and authorize the printing and distribution of *reprints* from the report of the State Board of Health, upon any subject of practical use and welfare of the people, in order that our citizens may be benefitted by the work of the Board without the state being put to the expense of sending out a complete Board of Health report to those not having use for it.

It should also explicitly compel all cities, towns and counties to *organize, as provided* under our public health law, and appoint a health officer, and he, if necessary, an assistant health officer in order that uniformity may be obtained.

The health officer should be *ex-officio* a member of the Board that appoints him. It should be his duty to have charge of all reports received, and all reports to the Board should be made through him. It should be his duty also to make and forward all reports required from the Local Board to the State Board or other authorities; in this way the services of a qualified person are secured for professional work, and a channel of communication is provided from one Board to another and to the community; professional skill as well as pride is appealed to for having correct and thorough reports, and divided responsibility avoided.

There should be a method devised of notification through the public prints that on and after a specified day all premises found in a defective sanitary condition by the health officer, must be put in proper and safe condition for the public health, at the expense of the person causing it, the same to be collected by distraint, provided that where the health officer shall certify that in any particular case, this method be unjust, the same shall be remitted by him upon a regular assessment roll against the property to the county treasurer, and collected the same as other taxes, and the amount when collected paid back to the authorities performing the work. Under the workings of our present law a health officer is kept running from tenant to agent and agent to owner, each one denying responsibility, or authority to move in the abatement of a nuisance, while an epidemic spreads so far that it involves an entire community, and many deaths attest to the roundabout way of fixing responsibility of a nuisance, or point of infection.

A health officer should have authority to inspect school houses, or places of public resort, either of worship or amusement, and when found dangerous to the public health, to condemn them, until renovated and put in safe condition; the inspection to include that of entrances and exits, to avoid fatality at fires.

The health officer should have the authority to compel the attendance of any public woman or prostitute, at either his office or the city or county or private hospital, for decision of the question of her having either syphilis, or gonorrhœa, or both; and if found infected, to compel her to place herself under the treatment of a physician and to cease plying her vocation until cured, this authority to be exercised upon the complaint of any person having knowledge of her being diseased.

All persons intending to practice medicine, surgery, midwifery, or any of their specialties, should be required to register such intention with the health officer of the city or county, in a book to be kept by him for the purpose, and to be a part of the public records, and open to public inspection. Said registry to state name, age, residence, date, and institution issuing the diploma or license under which he, or she may claim to practice, and the school or theory of medicine the person claims to practice, in order that the health officer may know from whom to require reports of births and deaths, and the public know who are practitioners of medicine, surgery, and obstetrics.

All county records of vital statistics and health matters should be kept in the clerk and recorder's office, but in the charge of the health officer, in order that the public may know where to look for information pertaining to such affairs.

The law should provide for every court to have the power to select and summon one or more educated practitioners of medicine and surgery, or of any specialty in either branch, as experts to answer such quesitons as may be propounded to them by the court or jury only, that may tend to give information upon the case at issue: a reasonable fee for said services to be certified to by the court, and paid for from the county funds. This would remove the evidence of medical witnesses from a status of partisanship, and leave them free to give a scientific opinion on the case without an apparent contradiction of previous expert testimony, in the interests of the party summoning them by the present method.

The law should encourage people to work out a portion of the road tax, and possibly all the poll tax, by planting and caring for trees along the roadside.

It should also prohibit the selling, or giving away of kerosene or other burning fluid of any kind that will give off inflammable vapor at a temperature of one hundred and forty degrees above zero of Fahrenheit, or become thickened or partially congealed at a temperature of twelve degrees, Fahrenheit, above zero.

Finally, the keeping of insane people longer than one month in a jail or poorhouse, or at home by their friends, should be prohibited, unless the health officer, upon actual inspection each month, certifies that such persons are provided with all reasonable and necessary medical and sanative care in their home by said friends, in order that neglect or abuse be prevented.

Respectfully submitted,

CHARLES AMBROOK, M. D.,
Secretary.

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